THE UNIVERSITY OF QUEENSLAND

Summary of the

Marine Radio Operators Handbook

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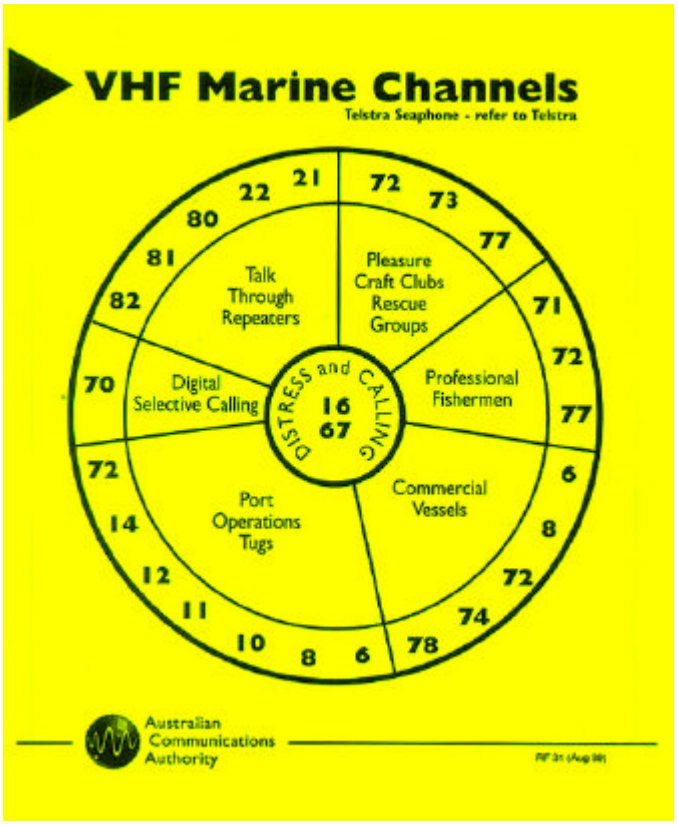

VHF channel assignment proposed by the ACA

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The candidate will be required to:

1. Demonstrate a practical knowledge of Global Maritime Distress and Safety System (GMDSS) sub-systems which is appropriate to vessels operating in Australian waters on which a radio installation is not compulsory under international agreements. Specifically, Medium Frequency (MF) / High Frequency (HF) and Very High Frequency (VHF) radiotelephony equipment with Digital Selective Calling (DSC) facilities, and emergency position indicating radio beacons (EPIRPs) of the 406MHz and 121.5 / 243MHz type.
2. Demonstrate an ability to use MF/HF and VHF radiotelephony and DSC operating procedures, particularly those relating to distress, urgency, and safety.
3. Demonstrate an understanding of simple maintenance practices required to keep the marine radio equipment in good working order, including the repair of minor faults.
4. Demonstrate an understanding of the regulations applicable to ship stations equipped with radiotelephony and DSC facilities.
5. Demonstrate a basic knowledge of the Australian marine search and rescue system.

Acronyms

ACA	Australian Communications Authority
AMSA	Australian Maritime Safety Authority
ASGD	Radiotelephony Alarm Signal Generating Device
ATU	Antenna Tuning Unit
AusSAR	The operating authority for RCC Australia
COSPAS-SARSAT	International Satellite System for Search and Rescue
CS/LCS	Coast Station / Limited Coast Station
DSC	a Digital Selective Calling system used for distress, urgency and safety radio messages
EPIRB	an Emergency Position Indicating Radio Beacon detectable via airplane and/or satellite
GMDSS	Global Maritime Distress and Safety System
HF	High Frequency (3 - 30MHz)
IDD	International Direct Dialing
LTU	Local User Terminal; a land-based satellite down-link
MH	Medium Frequency (0.3 - 3MHz)
MMSI	a 9-digit Maritime Mobile Service Identity number
MROH	Marine Radio Operator Handbook
RCC	Rescue Coordination Centre
SAR	Search and Rescue
SDD	????
SSB	Single Side Band (does not need a carrier frequency)
VHF	Very High Frequency (30 - 300MHz)

Distress Signals

Digital Selective Calling (DSC):

Frequencies for DSC distress alerts: Frequencies have been internationally allocated in the MF/HF and VHF marine bands for DSC distress, urgency and safety alerts. In each case there is a radiotelephony frequency associated with the DSC frequency for communications subsequent to the DSC alert. The DSC and associated radiotelephony frequencies are:

DSC frequency	Associated radiotelephony frequency
2187.5kHz	2182.0kHz
4207.5kHz	4125.0kHz
6312.0kHz	6215.0kHz
8414.5kHz	8291.0kHz
12577kHz	12290kHz
16894.5kHz	16420kHz
VHF Ch70 (156.525MHz)	VHF Ch16 (156.800MHz)

The MF/HF DSC frequencies indicated above are reserved exclusively for DSC alerts associated with **distress, urgency** and **safety** messages. The marine VHF channel 70 may additionally be used for routine station-to-station DSC alerts. Unless the frequency / channel is specifically indicated in the DSC alert then radiotelephony communications should follow on the associated radiotelephony distress and calling frequency. For example, on 2182kHz after a DSC alert on 2187.5kHz, or on VHF channel 16 after a DSC alert on VHF channel 70.

Priority, circumstances of use and authority to transmit: A distress alert from a vessel may be transmitted **only on the authority of the master or skipper**, or the **person responsible for the safety of that vessel**. It has absolute priority over all other transmissions and indicates that the vessel or person using it is threatened by grave and imminent danger and requests immediate assistance. All stations which receive a distress alert must immediately cease all transmissions capable of interfering with distress communications.

Transmission of DSC distress procedures: The distress alert should include the vessel's last known position and the time when it was valid. Once selected and initiated, a DSC distress **alert will continue to be automatically repeated until terminated by the operator**, or when a DSC distress alert acknowledgement is generated by another station and is received and decoded by the distressed vessel. The DSC distress alert from a vessel is transmitted as follows:

- Adjust the transceiver to an appropriate DSC distress channel (VHF channel 70, 2187.5kHz, etc.);
- If time permits, key in or select (i) the nature of the distress (from the menu if provided) and (i) the vessel's position (automatic with a GPS interface);
- Initiate a distress alert;
- Adjust the transceiver to the radiotelephony channel / frequency associated with the channel / frequency that the DSC alert was made with; and
- Transmit the standard radiotelephony distress call and message (the 2-tone radiotelephony alarms signal should precede this message if transmitted 2182kHz):

The distress call:

- (The signal) **MAYDAY** (spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SCAMP VL2345)

The distress message consists of:

- (The signal) **MAYDAY** (spoken once);

- ?? **Name** and **call sign** (of the station making the transmission, spoken once; e.g. SCAMP VL2345)
- ?? **Position** and **nature of distress** (e.g. 50 nautical miles = 91.25km due east point danger (or even better GPS); struck submerged object sinking rapidly, estimated time afloat 15 minutes, require immediate assistance. 20m motor cruiser with red hull, white superstructure, 4 persons on board, EPIRB activated).

All of the information transmitted in a DSC distress alert is decoded and displayed on other DSC-capable transceivers scanning the frequency / channel and is accompanied by an audible alarm to alert the operator. The broadcast of the radiotelephony distress call and message on a radiotelephony frequency / channel further alerts and advises stations of the distress situation.

Acknowledgment of receipt of DSC distress alert on 2187.5kHz & VHF ch70: Ship stations receiving a distress alert form another vessel should take note of the contents and immediately listen receptively on 2182kHz or VHF ch16 for the MAYDAY message that should follow. If the MAYDAY message is received and the receiving ship is able to provide assistance, then a **radiotelephony acknowledgement (received MAYDAY) should be sent** to the vessel in distress on 2182kHz or VHF channel 16, and **an appropriate CS/LCS advised**. If the receiving ship is not able to provide assistance and other stations are heard indicating involvement in a distress situation, then no acknowledgement should be sent.

Acknowledgment of receipt of DSC distress alert on 4207.5kHz & higher frequencies: As with the above, should take note of the contents and immediately listen receptively on 4125kHz etc. for the MAYDAY message that should follow **without sending a radiotelephony acknowledgement**. In situations where ship stations have received a DSC distress alert and (i) no MAYDAY message has been heard on the associated radiotelephony channel within 5mins; and (i) no other station is heard communicating with the vessel in distress, then the receiving ship should transmit a DSC distress relay to an appropriate CS/LCS.

Obligation to acknowledge distress messages and acknowledgement message: Ship stations which receive a distress message from another vessel (on 2187.5kHz or VHF ch70) which is, beyond any possible doubt, in the vicinity, **should immediately acknowledge receipt**.

However, in areas where reliable communications with a CS/LCS is practicable, ship stations should defer this acknowledgment for a short interval to allow the CS/LCS to acknowledge receipt.

Ship stations which receive a distress message which, beyond any possible doubt, is a long distance away, need not acknowledge receipt unless this distress message had not been acknowledged by any other station.

When a ship station hears a distress message which has not been acknowledged by other stations, but is not itself in a position to provide assistance, should acknowledge the call and then take steps to attract the attention of a CS/LCS or vessels which may be able to assist.

See " Transmission of distress message by station not in distress, circumstances and message "

Acknowledgment of Receipt of a Distress Message: Acknowledgment of receipt of a distress message by a vessel, CS/LCS is made by the following way:

The received distress call and message:

- ?? (The signal) **MAYDAY** (spoken once);
- ?? **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL VL6789)

- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station acknowledging receipt, spoken 3 times; e.g. SCAMP VL2345)
- ?? (The words) **RECEIVED** (or ROMEO) **MAYDAY** (spoken 3 times);

As soon as possible after this acknowledgement a ship station should transmit the following information:

- ?? **Position**, **the speed** at which it is proceeding, and the **approximate time** it will take to reach the distress scene.

Transmission of a DSC distress alert relay: Coast stations after having received an acknowledged DSC distress alert, will normally retransmit the information as a DSC alert relay. **Ship stations should normally consider transmitting a distress alert relay only when a distress alert has been received on 4207.5, 6312, 8414.5, 12577 or 16804.5kHz** and no other station is heard communicating with the vessel in distress on the associated radiotelephony channel. The distress alert relay must be addressed to an appropriate CS/LCS. The distress alert relay must not be addressed to "all ships". **Ship stations receiving a DSC distress alert on either 2187.5kHz or VHF ch70 should not transmit a distress alert relay**. Instead, a radiotelephony acknowledgement should be made to the vessel in distress on 2182kHz or VHF ch16, and the nearest CS/LCS should be informed. Ship stations may transmit a DSC distress alert relay in situations where a distress alert has not been received. However, this is restricted to situations where it is learned that another vessel in distress is not able to transmit the distress alert and the master of the ship not in distress considers that further help is necessary. In this case the DSC distress alert relay may be in the "all ship" format or, preferably, addressed to an appropriate CS/LCS. Some small vessel DSC transceivers may not provide a DSC distress alert relay facility. In this situation a MAYDAY relay message on the associated radiotelephony frequency may be substituted together with the provision of advice to a CS/LCS. A Marine Mobile Service Identity (MMSI) maybe used in cases where a vessel's name and call sign are not known. In the situation detailed above the MAYDAY relay message should be transmitted on a radiotelephony frequency or channel considered appropriate to the situation.

Transmission of distress message **by station Not Itself in distress** (MAYDAY RELAY) is outlined under radiotelephony distress calls (s.p.9).

Cancellation of an inadvertent DSC distress alert: Unlike radiotelephony procedures, it is possible to inadvertently initiate a DSC distress alert. Should this occur then it is essential that the initiating station immediately carry out the following procedures:

- ?? **Immediately switch off the transceiver** in question (this will cancel any automatic repeat of the DSC distress alert which would normally continue until a DSC acknowledgment is received);
- ?? **Switch the transceiver back on** and select the radiotelephony frequency / channel associated with the DSC frequency / channel on which the inadvertent alert was transmitted;
- ?? **Broadcast and "all stations"** radiotelephony message giving the vessel's name, call sign and MMSI **and cancel the distress alert**, giving an appropriate time for the inadvertent transmission. If the inadvertent distress alert was transmitted on several frequencies, it is necessary to broadcast cancellations on all associated radiotelephony frequencies.

If for some reason this procedures cannot be carried out, then the station must use other means to advice authorities that the alert was accidental.

Radiotelephony: Priority of distress, circumstances of use: A distress call has absolute priority over all other transmissions and indicates that the vessel or person using it is threatened by grave and immediate danger and requests immediate assistance. All stations which hear a distress call must immediately cease all transmissions capable of interfering with distress communications, and must continue to listen on the frequency on which the distress call was received. A distress call is not addressed to a particular station.
The obligation to accept distress calls and messages is absolute and must be accepted with priority over all other radiocommunications.

Authority to transmit: A radiotelephony alarm signal, a distress call, and a distress message from a vessel may be transmitted only on the authority of the master / skipper, or the person responsible for the safety of that vessel.

The associated MF/HF/VHF frequencies for distress: international (associated) frequencies for distress calls by radiotelephony are: 2182.0 4125.0, 6215.0, 8291.0, 12290, 16420kHz in the MF/HF marine bands and ch16 in the VHF marine band.
In Australian waters the following additional radiotelephony distress frequencies have been allocated:

- Ch67 (156.375MHz) in the VHF band (supplementary to ch16);
- 27.88MHz (ch88) and 27.86MHz (ch86, supplementary to ch88) both in the 27MHz marine band

Distress signal, call and message: The radiotelephony distress signal consists of the word "**MAYDAY**". This signal indicates that the vessel or person using it is threatened by grave and imminent danger and request immediate assistance. The distress signal must not be used under any other circumstances.
It should be noted that the use of the distress signal is only justified if the vessel or person using it is threatened by grave and imminent danger. It does not extend to situations where immediate assistance is sought on behalf of a person, for example, a medical emergency (the **urgency signal** should be used in this situations).
Misuse of the distress signal could result in attention being diverted away from a situation which really require immediate assistance.
The distress call:

- (The signal) **MAYDAY** (spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SCAMP VL2345)

The distress message consists of:

- (The signal) **MAYDAY** (spoken once);
- **Name** and **call sign** (of the station making the transmission, spoken once; e.g. SCAMP VL2345)
- **Position** and **nature of distress** (50 nautical miles = 91.25km due east point danger - including GPS data; struck submerged object sinking rapidly, estimated time afloat 15 minutes, require immediate assistance. 20m motor cruiser with red hull, white superstructure, 4 persons on board, EPIRB activated).

The distress call and message may be repeated as often as necessary, especially during silence periods, until an answer is received. If no answer is received on distress frequencies, the message should be repeated on any other available frequency, where attention might be attracted.
Obligation to acknowledge distress messages is handled the same way as described for DSC distress calls (s. p. 5).

Distress position information: Position information in a distress message should normally be stated in one of three ways:

- ?? Latitude and longitude (degrees and minutes in decimal points of a minute if necessary, north or south, east or west);
- ?? A true bearing and distance (unit of distance should always be specified, e.g. nautical miles or km) from a known geographical point (e.g. 045 true, Pt. Danger, 24 nautical miles = 36.5km);
- ?? A precise geographical location (e.g. in the case of a vessel running aground), or even GPS;

Distress traffic: Distress traffic consist of all communications relating to the immediate assistance required by the vessel in distress, including search and rescue and on a scene communications. The distress signal **MAYDAY** should be used to precede each call and message.

Control of distress traffic: The control of distress traffic is the responsibility of the vessel in distress. However, this station may delegate the control of distress traffic to a vessel, CS/LCS.

The vessel in distress, or the station in control of distress traffic may impose silence on any or all stations interfering with distress traffic by sending the instruction **SEELONCE MAYDAY**.

This instructions must not be used by any station other than the vessel in distress, or the station controlling distress traffic.

If another station near the distress vessel believes that silence is necessary it should use the instruction **SEELONCE DISTRESS** followed by its **own name** and **call sign**.

Any station which has knowledge of distress traffic and cannot provide assistance should continue to monitor the traffic until such time that it is obvious assistance is being provided.

Any station which is aware of distress traffic and is not taking part in it, is forbidden to transmit on any frequency which is being used for that traffic.

Ship stations not involved in the exchange of distress traffic may, while continuing to monitor the situation, resume normal radio service when distress traffic is well established and on the conditions that distress traffic frequencies are not used and no interference is caused to distress traffic.

Resumption of restricted working: Should the station controlling distress traffic consider that complete silence is no longer required on the distress frequency, the station should transmit on that frequency a message addressed to all stations indicating that restricted working may be resumed. Ship stations may then resume use of the distress frequency for normal purposes, but in a cautious manner and having regard that the frequency may still be required for distress traffic.

The message to announce resumption of restricted working should take the following form:

- ?? (The signal) **MAYDAY** (spoken once);
- ?? The call **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);
- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station sending the message; e.g. SCAMP VL2345)
- ?? (The words) **RECEIVED** (or ROMEO) **MAYDAY** (spoken 3 times);
- ?? **Time** the message originated;
- ?? **Name** and **call sign** (of the vessel in distress, spoken once; e.g. SEAGULL VL6789);
- ?? (The word) **PRUDONCE** (spoken once)

Resumption of Normal Working: When distress traffic has ceased on a frequency which has been used for distress traffic, the station which has been controlling that traffic should transmit a message addressed to all stations indicating that normal working may be resumed.

The message to announce resumption of normal working should take the following form:

- (The signal) **MAYDAY** (spoken once);
- The call **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station sending the message; e.g. SCAMP VL2345)
- (The words) **RECEIVED** (or ROMEO) **MAYDAY** (spoken 3 times);
- **Time** the message originated;
- **Name** and **call sign** (of the vessel which was in distress, spoken once; e.g. SEAGULL VL6789);
- (The word) **SEELONCE FENEE** (spoken once)

Transmission of distress message **by station Not Itself in distress**: A ship station, a CS/LCS which learns that a vessel is in distress may transmit a distress message on behalf of that vessel when:

(a) The vessel in distress can not itself transmit a distress message; or
(b) The master or skipper of a vessel not in distress, or the person responsible for CS/LCS, considers that further help is necessary; or
(c) Although nor in a position to provide assistance, it has heard a distress message which has not been acknowledged.

When a distress message is transmitted by a station not in distress, it is essential that this fact been made clear.

Failure to follow the correct radio procedures could cause confusion and delays or, in a worst case, assistance to be directed to the wrong vessel.

A distress message transmitted by a vessel, CS/LCS not itself in distress should take the following form:

The relayed distress call:

- (The signal) **MAYDAY RELAY** (spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL 6789)

The relayed distress message consists of:

- (The signal) **MAYDAY** (spoken once);
- **Name** and **call sign** (of the call station of the vessel in distress; e.g. SCAMP VL2345)
- **Position** and **nature of distress** (50 nautical miles = 91.25km due east point danger - including GPS data; struck submerged object sinking rapidly, estimated time afloat 15 minutes, require immediate assistance. 20m motor cruiser with red hull, white superstructure, 4 persons on board, EPIRB activated).

In the circumstances outlined in (a) and (b), this transmission should be immediately followed by a suitable message in which the position and circumstances of the distress vessel are provided. If the transmission is made by a vessel arriving at a distress scene to find rescue is beyond its resources, then the transmission should be followed by a message outlining this circumstances and providing the relay vessel's own position. In circumstance outlined in (c), the transmission should be followed by a repeat of the original distress message.

If facilities are available, the radiotelephony alarm signal should precede the transmission.

A **ship station should not acknowledge receipt of a MAYDAY relay** message transmitted by a CS/LCS unless definitely in a position to provide assistance.

Urgency Signals

Digital Selective Calling (DSC):

Circumstances of use, authority to transmit: A DSC urgency alert may be transmitted only with the authority of the master of skipper, or the person responsible for the safety of the vessel. It indicates that the station has a very urgent message to transmit concerning the safety of a vessel or aircraft, or the safety of a person.

Stations receiving a DSC urgency alert should not acknowledge receipt but simply tune their transceiver to the associated radiotelephony frequency / channel and await the radiotelephony transmission.

The transmission of the urgency call and message should follow immediately on the chosen radiotelephony working frequency / channel using the following procedures:

Frequencies for DSC urgency alerts: Frequencies have been internationally allocated in the MF/HF and VHF marine bands for DSC distress, urgency and safety alerts. In each case there is a radiotelephony frequency associated with the DSC frequency for communications subsequent to the DSC alert. The DSC and associated radiotelephony frequencies are:

DSC frequency	Associated radiotelephony frequency
2187.5kHz	2182.0kHz
4207.5kHz	4125.0kHz
6312.0kHz	6215.0kHz
8414.5kHz	8291.0kHz
12577kHz	12290kHz
16894.5kHz	16420kHz
VHF Ch70 (156.525MHz)	VHF Ch16 (156.800MHz)

The transmission of a DSC urgency alert by coast / limited coast and ship stations is carried out in the following manner:

- The announcement of the urgency message by DSC alert on a DSC frequency / channel, followed by;
- The transmission of the urgency call and message on the associated radiotelephony frequency / channel using radiotelephony procedures.

The announcement is carried out by:

- Tuning the transceiver to the appropriate DSC frequency /channel (2187.5kHz, VHF ch70, etc.).
- Selecting the “all ship” call format;
- Selecting the urgency priority; and
- Transmitting the DSC urgency alert.

The transmission of the urgency call and message should follow immediately on the associated radiotelephony frequency / channel and should take the following form:

The urgency call (distress frequency):

- (The signal) **PAN PAN** (spoken 3 times);
- (The targeting group) **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL 6789)

The urgency message consists of (working frequency):

- **Position** and **nature of the urgency call** (30 nautical miles = 54.75km to seaward of Cape Howe; lost propeller; estimate drifting southwest at 3knots; require tow urgently;).

Again, **stations receiving a DSC urgency alert should not acknowledge receipt** but simply tune their transceiver to the associated radiotelephony frequency / channel.

Radiotelephony: Circumstances of use, authority to transmit: Use of the urgency signal indicates that the station sending it has a very urgent message to transmit concerning the safety of a vessel or aircraft, or the safety of a person.
The urgency signal many only be sent on the authority of the master or skipper, or person responsible for the safety of the vessel.
All station which hear an urgency message signal must take care not to interfere with the message that follows.

Urgency signal and message and frequencies: The urgency signal and message are normally sent on one or more of the distress frequencies / channels. However, transmission of the message following the urgency signal should be transferred to an associated working frequency / channel if:

- ?? It is lengthy or it concerns an **urgent medical case**, or
- ?? After the initial broadcast on the distress frequency / channel it needs to be frequently repeated (generally applies only to coast stations).

If addressed to all stations, the **originating station must cancel the message when** action is **no longer necessary**.

The urgency call (distress frequency):

- ?? (The signal) **PAN PAN** (spoken 3 times);
- ?? (The targeting group) **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);
- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL 6789)

The urgency message consists of (working frequency):

- ?? **Position** and **nature of the urgency call** (GPS data or 30 nautical miles = 54.75km to seaward of Cape Howe; lost propeller; estimate drifting southwest at 3knots; require tow urgently;).

Again, **stations receiving a DSC urgency alert should not acknowledge receipt** but simply tune their transceiver to the associated radiotelephony frequency / channel.

Safety Signals

Digital Selective Calling (DSC):

Circumstances of use: The transmission of a DSC safety alert indicated that the station has a message to transmit concerning an **important navigational or weather warning**.

Stations receiving a DSC safety alert should not acknowledge receipt but simply tune the transceiver the associated radiotelephony frequency channel and await the radiotelephony announcement.

Frequencies for DSC urgency alerts: Frequencies have been internationally allocated in the MF/HF and VHF marine bands for DSC distress, urgency and safety alerts. In each case there is a radiotelephony frequency associated with the DSC frequency for communications subsequent to the DSC alert. The DSC and associated radiotelephony frequencies are:

DSC frequency	Associated radiotelephony frequency
2187.5kHz	2182.0kHz
4207.5kHz	4125.0kHz
6312.0kHz	6215.0kHz
8414.5kHz	8291.0kHz
12577kHz	12290kHz
16894.5kHz	16420kHz
VHF Ch70 (156.525MHz)	VHF Ch16 (156.800MHz)

The transmission of a DSC safety alert by coast / limited coast and ship station is carried out in the following manner:

?? The DSC announcement of the safety message by DSC alert on a DSC frequency / channel; followed by

?? The radiotelephony announcement on the associated radiotelephony frequency / channel that a safety message will follow on a working frequency / channel; followed by

?? The transmission of the safety call and message on a radiotelephony working frequency / channel.

The DSC announcement is carried out by

?? Tuning the transceiver to the appropriate DSC frequency / channel (2187.5kHz, VHF ch70, etc.);

?? Selecting the “all ship” call format;

?? Selecting the safety priority; and

?? Transmitting the DSC safety alert.

The transmission of the safety call and message should follow immediately on a working frequency should follow immediately on the associated radiotelephony frequency / channel and should take the following form:

The safety call (distress frequency):

?? (The signal) **SECURITE** (spoken 3 times);

?? (The targeting group) **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);

?? (The words) **THIS IS** (or DE spoken DELTA ECHO);

?? **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL 6789)

The safety message consists of (working frequwncy):

?? **Position** and **nature of the urgency call** (GPS data or 30 nautical miles = 54.75km to seaward of Cape Howe; submerged ship container; estimate drifting southwest at 3knots).

Again, **stations receiving a DSC safety alert should not acknowledge receipt** but simply tune their transceiver to the associated radiotelephony frequency / channel.

Radiotelephony: Circumstances of use: It indicates that the station using it is about to transmit a message concerning an important navigational or weather warning. It should not be used to precede routine weather forecast.

Safety signal and message: The safety signal consists of the word **SECURITE**.

It indicates that the station using it is about to transmit a message concerning an important navigational or weather warning. It should not be used to precede routine weather forecasts.

Ship stations hearing the safety signal should continue to listen until they are satisfy that it does not concern them. They must not make any transmission which is likely to interfere with the message.

The safety signal and call to all stations should normally be made on a distress frequency. However, the safety message which follows should be made on a working frequency.

The safety call (distress frequency):

- (The signal) **SECURITE** (spoken 3 times);
- (The targeting group) **HELLO ALL STATIONS** (or CQ spoken CHARLIE QUEBEC spoken 3 times);
- (The words) **THIS IS** (or DE spoken DELTA ECHO);
- **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SEAGULL 6789)

The safety message consists of (working frequency):

- **Position** and **nature of the urgency call** (GPS data or 30 nautical miles = 54.75km to seaward of Cape Howe; submerged ship container; estimate drifting southwest at 3knots).

Again, **stations receiving a DSC safety alert should not acknowledge receipt** but simply tune their transceiver to the associated radiotelephony frequency / channel.

General Regulations

Ship Station License: Under the Radiotelecommunications Act 1992 (RTCA) a maritime ship station apparatus license issued by the Australian Communications Authority (ACA) is necessary before radio transmitting equipment is installed or used on any Australian vessel.

The license shows the station licensee, the **name**, and the **call sign** of the vessel. Frequencies authorized for use, technical and general requirements are detailed in the ACAs RTCA license conditions (maritime ship license) determination. The station licensee is legally obliged to observe license conditions set out in this document.

A ship station license's does not permit the operation of a "home base". Except in special cases, marine radio equipment in private residences will not be authorized by the ACA.

Authority of Master: A ship radio station under service it provides is placed under the authority of the master or skipper; or the person responsible for the safety of the vessel.

Secrecy of Communications: Under the International Radio Regulations, an operator and any other person who becomes acquainted with the contents of a radiotelegram, rediotelephone call, or radiotelex call is placed under an obligation to preserve the secrecy of such information.

The secrecy restrictions do not apply to distress, urgency, or safety alerts or messages, or any message that is addressed to "all stations".

False or deceptive distress or urgency calls: the **transmission of false or deceptive distress, urgency, or safety signals is strictly forbidden**. Extreme severe penalties, including imprisonment, exists under RTCA for any person found guilty of making such a transmission.

Unnecessary transmissions: It is an offence under the RTCA to use a transmitter in a manner that is likely to cause a reasonable person to be seriously alarmed or affronted, or for the purpose for harassing a person.

Log Keeping: operators **should keep a record of all distress alerts** and messages transmitted or received. Particulars should include the station or stations with which the message where exchanged, the frequencies used, and the date and times of transmission and reception.

Avoidance of Interference: operators should take every precaution to ensure that the transmissions will not cause harmful interference to other stations. It is important that all operators:

- **Listen before transmitting** to ensure that the frequency is not already in use;
- Use the **minimum transmitting power** necessary for reliable communications;
- **Strictly observe the purpose** for which a frequency is assigned;
- Keep **test signals to a minimum**.

Ship Station Identification: **Transmission without identification are forbidden**.

A ship station must be identified either by the use of the official international **call sign** allocated by the ACA or by the **ship's name** or, preferably, a combination of both. If using DSC the vessel's Maritime Mobile Service Identity (**MMSI) will automatically inserted** into the transmission.

If transmitting radiotelephony distress, urgency, or safety messages, or if involved in search and rescue operations, the use of an official call sign is necessary to avoid confusion between vessels of the same or similar names.

To use DSC techniques, a MF/HF or VHF transceiver must be permanently programmed with a **unique nine digit identification**

number known as MMSI. This can be regarded as the electronic equivalent of a radiotelephony call sign and uniquely identifies that coast / limited coast or ship station.

The MMSI is automatically included in all DSC transmissions from a station and electronically identifies that station to the receiving station(s). The MMSI also acts as an ”electronic filter” whilst the transceiver is operating in the watch-keeping mode to ensure that only routine DSC alerts intended for that station are actually decoded and displayed. The filter is deactivated when any DSC alert carrying a DSC alert indicator is received as these messages are implicitly addressed to all stations. Similarly, DSC urgency and safety alerts which are not specifically addressed to a particular station will be received by all stations within radio range and keeping a DSC watch.

Information for CS/LCSs: Ship station operators are encouraged to **provide departure, positional and arrival information** to CS/LCSs operated by marine rescue organizations.

If undertaking a lengthy voyage, a **position report should be passed daily** to a CS/LCS.

Coast and Limited Coast Stations (CS/LCS)

Definition of Coast Station and Services provided: A coast station is a station on land established for the purpose of communicating with vessels at sea. Australian coast stations provide the following services to vessels:

- ?? **Search and rescue** (SAR) operations in conjunction with the Rescue Coordination Center (RCC) in Canberra;
- ?? **Weather forecast and warnings** for coastal waters and high seas areas;
- ?? **Navigational warnings**;
- ?? **Continuos listening watch on distress frequencies** for the purpose of safety of life at sea;
- ?? **Radiotelephone and rediotelex call and services** to and from and dresses and subscribers in Australia and overseas (this services are termed public correspondence);

In Australia, all coast stations are operated by Telstra Global Satellite and Radio Services (Telstra). SAR and safety of life at sea services are performed on behalf of the Australia Maritime Safety Authority (AMSA).

Identification of Coast Stations: Australian coast stations generally identify themselves by using the geographical location followed by the word "radio", e.g. BRISBANE RADIO, or MELBOURNE RADIO, etc.

Coast stations may also identify themselves by the use of their official radiotelephony call signs, e.g. MELBOURNE RADIO VIM (Victor India Mike).

Coast stations offering DSC service are identified by a nine digit code as MMSI.

Medical Advice: All Australian coast stations have formal arrangements with government and local health authorities and will relay medical advice to and from the vessels at sea, free of charge.

Vessels requiring this service should contact a coast station on a suitable calling frequency. Depending on the availability of suitable MF/HF or VHF frequencies, the coast stations operator will establish a direct telephone link with a doctor.

In **urgent medical cases, the radio telephony urgency signal PAM PAM** or a **DSC urgency alert** may be used to establish communications with a coast station.

Definition of Limited Coast Stations and Services provided: Limited Coast Stations are stations on land established for the purpose of communicating with vessels at sea.

The services provided by limited coast stations is restricted to communications concerning the safety, movements and operations of vessels. This service may include communications relating to fishing, or other commercial operations, club events, the broadcast of weather and navigational information, and SAR.

Unlike coast stations, limited coast stations are not permitted to handle public correspondence to or from destinations ashore. Limited call stations offer a service to vessels in the MF/HF, 27MHz and VHF marine bands.

Hours of operation of Limited Coast Stations: There are no fixed hours for the radio service provided by limited call stations and many will not offer a continuos service. Hours of operation will be determined by local requirements or, in some cases, by state government legislation.

General Operating Procedures

Concept of DSC: While the main use of DSC by small vessels will be for distress, urgency, and safety purposes, the technique may also be used for routine calling. **DSC is a semi-automated means of establishing initial contact between stations**. **Once this contact has been established, normal radiotelephony is used for subsequent communications**. DSC can be used to initiate ship to ship, ship to shore, and shore to ship communications. Information transmitted by DSC is generally known as a DSC alert.

A DSC alert is a brief burst (typically seven seconds am MF/HF, and 0.5 seconds on VHF) of digital information transmitted for one station to alert another station or stations, and to provide some basic information (excluding alert duration).

DSC alerts are transmitted on MF/HF and VHF marine frequencies specially reserved for this type of transmission. The DSC alert indicates the identity of the calling station and the purpose of the call.

The way in which the transmitted DSC alert is encoded by the initiating station selects which station or stations will decode the information. Whilst all stations listening on the DSC frequency will receive the alert, only these stations selected by the transmitting station will actually decode and have the message available. This will be signaled by audible alarm to alert the operator.

DSC alert bearing the distress alert priority will be decoded by all stations receiving the alert.

Encoding of a DSC message prior to transmission is performed manually by an operator using transceiver front panel controls. Received information is decoded and made available in alphanumerical form on a liquid crystal or fluorescent display incorporated in the equipment.

DSC call formats: The international DSC system provides for the following types of alerts:

- Distress alert – these calls are implicitly addressed to all stations. The alert contains the vessel's MMSI, position, and possible nature of the distress.
- Distress alert acknowledgement – normally sent by CS/LCSs in response to a distress alert. Maybe used by ship stations only under certain circumstances.
- Distress alert relay – Normally sent by CS/LCSs. Maybe used by ship stations only under certain circumstances.
- All ships (all station) – used to alert all stations that a distress, urgency or safety broadscast will follow.
- Single ship (single station) – used to alert a particular station to a distress urgency, or safety message to follow. Some small vessel equipment may not permit the inclusion of the distress or safety priority. This call is also use to alert another station to a routine call. The MMSI of the desired station must always be known and manually entered into the transceiver.

It is essential that operators of the DSC – capable equipment are familiar with the particular alert options provided on the transceiver in use. It should be noted that the "All ship" format include CS/LCSs. Similarly the "single ship" format is used to address a particular CS/LCS.

Some small vessel DSC-capable transceivers may not provide a distress alert relay format.

Information in a DSC alert: A DSC alert contains the following information as digitized data:

- The **identity of the calling station** (MMSI);
- The **priority of the alert** - distress, urgency, safety or routine; and
- The **stations being called** (specified station or stations).
- The **GPS data** (if attached via interface to satellite receiver).

Test transmissions: When it is necessary for a ship station to transmit signals for testing or making technical adjustments which are likely to interfere with the working of a nearby CS/LCS, the prior consent of that station should be obtained.

All testing signals should be kept to a minimum particularly on frequencies used for distress, urgency, and safety purposes.

Control of communications: **During routine communications** between a ship station and **the CS/LCS, the CS/LCS controls the working**. In order that communications maybe exchanged efficiently, all instructions given by CS/LCSs should be obeyed without delay. However, this does not prevent a ship station making a suggestion concerning a working frequency or other on-air operations.

Ships stations must not interfere with CS/LCS communications.

During **routine communications between ship stations, the called ship station controls** the subsequent exchange of communications.

Purpose of calling and working frequencies: Radiotelephony frequencies assigned to ship, CS/LCSs are categorized as either calling or working:

?? Calling frequencies are used to established communications with coast /limited coast, and other ship stations; and

?? Working frequencies are used to exchange messages relating to the operation and movement of vessels and to conduct public correspondence communications.

All station may established communications with the desired station by using a radiotelephony calling frequency. Once communications had been established; communications should be transferred to a working frequency and the messages exchange. At the conclusion of working station should resume monitoring of the appropriate calling frequency.

Calling frequencies: The main radiotelephony bands for establishing routine communications with an Australian CS/LCS, or another ship are the associated radiotelephony frequencies:

?? 2182, 4125, 6215, 8291, 12290, and 16420kHz in the MF/HF marine bands;

?? 27,88 and 27.86MHz (ch88, and 86) in the 27MHz marine band;

?? ch16 and 67 in the VHF marine band

The marine VHF channel 70 may additionally be used for routine station-to-station DSC alerts.

Routine ship-to-ship DSC alerts should be made only on VHF ch70 and will require the sender to know and program the MMSI to the vessel to be called. (For a detailed list of calling and working frequencies, see MROH[1]).

Radio telephony calling procedures: as a general rule, it rests with the ship station to call and establish communications with a CS/LCS. However, a CS/LCS wishing to communicate with a ship station may call that vessel if it believes that it is within range and is keeping watch.

A ship station wishing to contact another station must first select a frequency that is being monitored by that station.

Before transmitting, the operator should listen for a period long enough to be satisfied that harmful interference will not be caused to communications already in progress.

When establishing communications by radiotelephony, the initial call should be made in the following manner:

The routine call:

?? **Name** and **call sign** (of the station being called, spoken 3 times;

[1] MROH: http://www.aca.gov.au/licence/marine/handbook.pdf
http://www.emjay.net.au/radio_operators_handbook.pdf

e.g. SEAGULL VL6789)
- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station making the transmission, spoken 3 times; e.g. SCAMP VL2345)

The purpose of the routine call consists of:
- ?? **Purpose** (e.g. suggested chance to working frequency; e.g. 2201kHz, followed by the word) **OVER** (spoken once);

This call should be immediately be followed with the purpose of the call, the working frequency that is suggested for the exchange of messages and the word "**OVER**" (an invitation for the other station to respond).
When using radiotelephony frequencies in the VF marine band and communications conditions are good, the first part may be abbreviated to:
The routine call:
- ?? **Name** and **call sign** (of the station being called, spoken once; e.g. SEAGULL VL6789)
- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station making the transmission, spoken twice; e.g. SCAMP VL2345)

The purpose of the routine call consists of:
- ?? **Purpose** (e.g. suggested chance to working frequency; e.g. 2201kHz, followed by the word) **OVER** (spoken once);

On all bands, once contact is established, station **names** and / or **call signs** should be **spoken once only**.
Reverse calling, should be avoided; e.g. TEMPEST VLS5678 CALLING DARWIN RADIO;

Replying to radiotelephony calls: A station replying to a radiotelephony call should use the following procedure:
The reply to a routine call:
- ?? **Name** and **call sign** (of the station being called, spoken 3 times; e.g. SCAMP VL2345)
- ?? (The words) **THIS IS** (or DE spoken DELTA ECHO);
- ?? **Name** and **call sign** (of the station replying the transmission, spoken 3 times; e.g. SEAGULL VL6789);

The purpose of the routine reply call consists of:
- ?? **Purpose** (e.g. suggested chance to working frequency; e.g. 2201kHz, followed by the word) **OVER** (spoken once);

Once the naming the working frequency terminated with the word **OVER**, both parties are invited to switch to the new frequency;

The reply should be immediately followed by an indication that the replying station will also change to the working frequency suggested by the calling station.

Difficulties in establishing communications by radiotelephony: If a vessel, CS/LCS is unable to communicate with a calling station immediately, it should reply to a call followed by: "**WAIT xx MINUTES**";
When a station receives a call without being certain that the call is being intended for it, it should not reply until that call has been repeated and understood.
When a station receives a call which is intended for it, but is uncertain of the identification of the calling station, it should reply immediately asking for a repetition of the call sign or other identification or other identification of the calling station.

Radiotelephony silence periods, times, purpose and frequencies: To increase the safety of life at sea, **two 3-minutes periods** of radiotelephony silence must be observed in each hour.

Radiotelephony **silence periods starts on the hour** and continue to three minutes past the hour, and **on the half hour until 33 minutes past** the hour.

With the exception of distress calls and messages, all transmissions on 2182kHz from all stations must cease during these periods.

International regulation require silence periods to be observed on the distress and calling frequencies of 2182kHz.

However, it is normal practice in all Australian waters to observe silence periods on the associated radiotelephony frequencies of 2182, 4125, 6215, 8291, 12290, 16240kHz and VHF ch16 for routine calling.

Monitoring of distress and calling frequencies: Ship stations are encouraged to keep maximum practicable watch on the radiotelephony distress and calling frequencies appropriate to their location and the type of marine radiocommunications equipment fitted, particularly during silence periods.

Telstra coast stations on the east and west coast of Australia maintain a continuos watch on all the MF/HF DSC frequencies identified for distress, urgency, and safety alerts. Telstra coast stations do not provide watchkeeping on VHF ch70.

There is a high probability that a distress alert received on VHF ch70 or on 2187.5kHz will be local and it is recommended that these are monitored of a DSC facility is fitted.

Phonetic alphabet: When it is necessary to spell out call signs and words the following letter spelling table should be used:

Letter to be transmitted	Code word to be used
A	alfa
B	bravo
C	charlie
D	delta
E	echo
F	foxtrot
G	golf
H	hotel
I	india
J	juliet
K	kilo
L	lima
M	mike
N	november
O	oscar
P	papa
Q	quebec
R	romeo
S	sierra
T	tango
U	uniform
V	victor
W	whiskey
X	x-ray
Y	yankee
Z	zulu

Public Correspondence Communications

Stations accepting radiotelephone calls: **Only coast stations are licensed to handle radiotelephony calls** between vessels and subscribers ashore. Limited coast stations are not permitted to provide this service.

Ship to shore radiotelephone calls: A vessel wishing to place a radiotelephone call to a subscriber ashore should attract the attention of a coast station on a suitable "on demand" or "primary" channel (see below; on demand service). Details of coast stations offering this service, hours of service, and channels may be found in Telstra's Radio & Satcom Services Guide. Outside these published hours of service, vessels should call on a suitable calling frequency and transfer to an appropriate working channel to place the call (see above; radiotelephony calling frequencies).

Once communications have been established on the working channel, the ship station should advise the coast station of the STD or IDD code and telephone number required. The coast station will request the ship station to "stand by" while the call is connected. When the call is answered and the number confirmed, the coast station operator will advise the ship to "go ahead". The call may then proceed.

On demand service: Coast stations monitor working channels which are termed "on demand" or "primary" channels. By using an "on demand" or "primary" channel, ship stations wishing to make a radiotelephone call need not first attract the attention of that coast station on a calling frequency.

The "on demand" or "primary" channel can be used both to attract the attention of the coast station and to make the radiotelephony call.

When the "on demand" or "primary" service is not operating, it is necessary for ship stations to follow normal procedure and attract the attention of the coast station on a calling frequency before changing to a working channel.

All VHF channels allocated for radiotelephone calls operate continuously in an "on demand" or "primary" mode during the hours of service of the coast station.

Auto Seaphone: For ship stations with the necessary option fitted to the VHF marine radio equipment, the computerized auto seaphone service provided by Telstra allows direct dialing of telephone subscribers anywhere in Australia or overseas to coast stations and numerous unmanned land stations. No Telstra operator connection is required.

Auto Seaphone 999 Service: Where a service on the associated radiotelephony VHF ch16 or 67 is provided by either a CS/LCS it should be the primary means of distress and urgency communications. Telstra 999 service **supplements this service for the VHF ship stations**.

If a distress, or urgency call on VHF ch16 or 67 has been unsuccessful, a ship station operator may attract the attention of a coasts station by selection an appropriate autoseaphone channel for its location and using the keypad entry 999.

If the channel is not occupied with another call, or under most circumstances even when the channel is occupied, **the 999 emergency signal** will be received by the land base and recognized by the computer system. An alarm will be given at the call station and information will be immediately available to the coast station operator concerning the vessel's name, call sign, owner's name, address, and telephone number.

Emergency Position Indicating Radio Beacons (EPIRB)

The signal from a EPIRB is regarded by the authorities as a signal of distress and is given an appropriate response. It is the responsibility of every owner of an EPIRB to ensure that it is not activated unintentionally, or in situations that do not justify its use.

Description, purpose: An EPIRB is a small, **self contained, battery operated radio transmitter** which is both watertight and buoyant.
The essential purpose of an EPIRB is to assist in determining the position of survival in search and rescue operations.

Types of EPIRBs, methods of detection and location: There are 2 types of approved EPIRB available in Australia which are suitable for small vessel use:

- a small, inexpensive type which operates on the aircraft VHF frequencies of **121.5 and 243MHz** which may be designed either for carriage on a vessel or for attachment to a lifejacket; and
- the more expensive and more sophisticated type which operates on the frequency of **406.025MHz** with the addition of 121.5MHz transmitted for aircraft homing (usually referred to as a 406MHz EPIRB).

Once activated, both types are capable of being detected and located by aircraft and a specialized satellite-aided system known as COSPAS-SARSAT[2].

COSPAS-SARSAT satellite system: The COSPAS-SARSAT system is a satellite-aided search and rescue system designed to locate activated EPIRBs transmitting on 121.5 and 406.025MHz.

Geographical limitations to detection of 121.5 / 243 MHz EPIRBs by satellites: Because of the requirement that an **orbiting satellite must simultaneously "see" both the activated EPIRB and a land based Local User Terminal (LUT)**, detection and location of 121.5 / 243MHz EPIRBs is limited to particular geographical areas surrounding a LUT.

Global detection of 406MHz EPIRBs: Because of the **satellite's ability to memorize signals from a 406MHz EPIRB**, detection and location of this type of beacon does not suffer the geographical limitations of the 121.5 / 243MHz model. An activated 406MHz EPIRB can be detected at any place on the earth's surface.

Identification and registration of 406MHz EPIRBs: Every **406MHz EPIRB has a unique identity code which is transmitted as part of its signal** on which also indicates the country of registration. This code is programmed into the beacon by the supplier before it is offered for purchase.
If this system is to work successfully, and for their own safety, it is essential that purchasers of 406MHz EPIRB complete the registration forms provided by the supplier and mail it to RCC Australia in Canberra. The completion of this registration process will ensure that the RCC is equipped with information vital for a successful rescue mission.

On-air testing of EPIRBs prohibited: An EPIRB must not be tested, except strictly in accordance with the manufacturers instructions for self-testing.

Inappropriate activation of EPIRBs: Every year valuable government search and rescue resources are wasted in locating EPIRBs which have been activated inadvertently or maliciously. Most cases of accidental

[2] CPSPAS-SARSAT: http://www.cospas-sarsat.org/

transmission resort from unsuitable storage, or failure to totally disable an old model EPIRB before disposal. Theft and subsequent malicious activation of EPIRBs is an increasing problem. An owner should take care to minimize opportunities for beacons to be stolen. The need to treat EPIRBs responsibly cannot be too highly emphasized.

Should a boat owner suspect that an EPIRB has been activated inadvertently, this information must immediately be passed to RCC Australia in Canberra on telephone 1800.641.792 (24h number). If accidental activation is discovered whilst at sea, this information should be immediately passed to a CS/LCS operated by a marine rescue organization, another vessel for own-forwarding to the RCC Australia. In the case of a genuinely accidental activation of an EPIRB, an owner or operator need have no fear of being penalized by search and rescue authorities.

Marine Radiocommunication Equipment

Three types of marine radio equipment: These are:

?? Equipment operating in the 27MHz marine band (usually referred to a 27Meg marine);
?? Equipment operating in the international VHF marine band; and
?? Equipment operating in the international MF / HF marine bands.

Each type has its own advantages and disadvantages. MF/HF and VHF marine radio equipment may have DSC capability in addition to radiotelephony. 27MHz marine equipment will be radiotelephony only.

Approximate ranges and relative advantages/disadvantages: the 27MHz marine equipment offers:

?? Communications range, under favorable conditions, of between 10 and 50km (5.5 and 27 nautical miles);
?? A safety service provided by limited coast stations operated by marine rescue organizations;
?? The advantages of being cheap and easy to install; but
?? The disadvantages of being subject to interference from atmospheric and ignition noise (and on occasions, from distant radio stations) and of not providing access to a radiotelephone service.

VHF marine equipment offers:

?? Communications range of vessels of up to 20km (11 nautical miles); and between vessels and shore of 50km (27 nautical miles), possibly significantly greater;
?? A safety service provided by CS/LCSs operated by marine rescue organizations;
?? The advantages of being relatively inexpensive, providing the highest quality signals, of suffering least from interference caused by atmospheric or ignition sources, and of providing access to a radiotelephone service; but
?? The disadvantage of suffering blind spots behind cliffs, sand hills, and heavy vegetation.

VHF marine equipment is suitable for small vessels remaining relatively close to the coast and within range of CS/LCSs operated by marine rescue organizations.

MF/HF marine equipment offers:

?? Communications range of many 1000s of km, and worldwide given the correct choice of frequency band;
?? A safety service provided by CS/LCSs operated by marine rescue organizations;
?? The advantages of being able to change frequency bands to provide communications over the desired range, and to provide access to a radiotelephone service; but
?? The disadvantage of high cost, complex installation, of a requirement for greater operator expertise, and of being subject to atmospheric or ignition sources.

Because it does not suffer the range limitations of 27MHz and VHF marine equipment, MF/HF marine equipment is the only system recommended for vessels undertaking lengthy coastal or overseas voyages.

Radio propagation at VHF: as a general rule, VHF communications between 2 stations over all-water path, are possible over a maximum range of approximately the combined line of sight distances of each station. It follows that the greater the heights of the transmitting and receiving antennas, the greater will be the communications range.

Radio propagation at MF and HF: MF/HF marine radio equipment will always offer the operator a selection of frequencies in different bands, e.g. 2182kHz in the 2MHz band, 4125kHz in the 4MHz band, 6215kHz in the 6 MHz band, etc. This allows the operator to select a frequency which will be suitable both for the distance over which communications are

required, and the time of day and season.

One rule for frequency selection is to use the lower frequencies when close to the required station and the higher frequencies when further away. During hours of darkness, a frequency lower than that necessary during the day is more likely to be effective ("the higher the sun, the higher the frequency").

A very approximate guide to the use of MF/HF frequencies is:

?? Use 2MHz band frequencies for communicating with stations within 100km (55 nautical miles), day or night;

?? Use 4MHz band frequencies for daytime communications with stations at distances greater than 100km, or if no response to calls on 2MHz, and for nighttime communications when 2MHz is unsatisfactory;

?? Use 6MHz band frequencies for daytime communications when 4MHz is unsatisfactory, and at night when 2MHz and 4MHz are unsatisfactory; and

?? Use frequencies in the 8, 12, 16 and 22MHz bands to provide progressively greater communications and when distance prevents satisfactory use of the lower frequencies.

The correct selection is the lowest frequency that will provide satisfactory communications with the wanted station. However, this is often a matter of experience rather than textbook knowledge.

Major parts or radio equipment: Marine radio equipment, whether operating in the 27MHz, VHF, or MF/HF bands is made up of 3 major parts:

?? The antenna or aerial;

?? The transmitter and receiver; and

?? The power supply

Each part is dependant on the other. A fault in any one of the parts will not allow the equipment to function correctly.

Transceiver controls : this section details the functions of important operator controls which may be found on marine radio equipment. Not all will be found on each type of equipment.

On/Off and volume control: often these functions are combined into a single control. It is used to turn the equipment on or off, and to adjust the level of signals coming from the loudspeaker.

Channel selector: this control is used to select the channel or frequency on which transmission or reception is required.

Squelch or Mute control: this control allows the operator to stop the constant and annoying background roar from the receiver in the absence of an incoming signal. On VHF and 27MHz marine equipment, it is usually an adjustable control. The correct setting is so that the roar just cannot be heard. Further operation of the control is undesirable as these will progressively desensitize the receiver and may prevent reception of weak signals. If provided on MF/HF equipment, the level of muting is preset and can only be turned off or on.

AM/SSB emission control (on some MF/HF equipment, this control maybe marked H3E/J3E): this control will be found on most MF/HF transceivers and on those 27MHz transceivers with SSB option. It controls the mode of transmission and reception.

RF Gain control: this control will only be found on some 27MHz and MF/HF transceivers. It is used to vary the strength of received signals and has an effect similar to the volume control. However, except when receiving, unusually strong signals, should be kept close to maximum and the volume control used to adjust signals to a comfortable level.

Noise Limiter (Noise blanker): the control maybe switched on to minimize the effect of loud static or ignition interference on received signals. It should be used with care as it may also desensitize the receiver to wanted signals.

Power selector: this control varies the power of the transmitted signal. On

VHF marine equipment it may be marked “25W/1W” or “high/low”. The use of more power than is required to communicate satisfactorily is a breach of international radio regulations, as it may cause unnecessary interference and drains the battery supplying the equipment at a faster rate.

Dual Watch (DW): this control will be found only on some VHF equipment. On operation it will permit the operator to keep listening watch on 2 different VHF channels.

Clarifier: this control will be found on most MF/HF transceivers and those 27MHz transceivers which are fitted with a SSB operation. It provides a means of fine-tuning incoming SSB signals that sound distorted or “off station”. It has no effect on transmitted signals. On SSB transceivers not fitted with a clarifier control, an alternative method of fine tuning of fine signals is provided.

Antenna or Aerial Tuning Unit (ATU): this unit will be found only with MF/HF equipment and maybe separate or incorporated with the transceiver. An ATU is necessary to adjust the “electrical” length of the antenna to ensure that maximum transfer of power from the transmitter can take place on different frequency bands. ATUs may tune automatically, or require manual adjustment.

Radiotelephony Alarm Signal Generating Device (ASGD): this control is found only on some MF/HF transceivers. Operation causes the radiotelephony alarm signal to be transmitted. A test function may also be provided to permit the function to be tested without transmission.

International / USA control: this control may be found on some VHF marine equipment. It is provided by the manufacturer to permit communications with stations in the USA which do not conform to the international VHF channel plan. It is important that this control is kept in the international position at all times unless in the coastal water of the USA.

Press-to-Talk control: this spring-loaded control is located on the microphone. When pressed it activates the transmitter allowing transmission of signals. When released, the equipment is returned to the receive mode.

Single Side Band (SSB): SSB mode of transmission causes both the transmitter and receiver to operate in a very effective manner and improve chances of successful communications under poor conditions or at extremes of range. It also makes efficient use of radio frequency space or spectrum.

Series connection of Pb-acid cells: Cells maybe connected in series, that is, the positive terminal of one cell to the negative terminal of another cell, to produce higher voltages.

Most Pb-acid batteries are supplied in 6 or 12V combinations and may themselves be connected in series to provide the required output voltage.

Essential battery maintenance: to ensure the best performance of a battery it is important that the Pb-acid battery:

- ?? Is kept clean, dry, and free from terminal corrosion;
- ?? Has the electrolyte kept at a correct level;
- ?? And is kept correctly charged.

A battery should be kept clean. A dirty battery may hold spilled electrolyte on its surface, thereby providing a path for the electrical current to leak away. It is important to keep the outside surfaces of a battery dry and free of contamination.

Corrosion forming on terminal clamps may seriously affect, or even prevent, the ability of the battery to supply current. Corrosion will be evident by the formation of a white-green powder between the battery terminals and the terminal clamps.

The level of electrolyte in a battery is important. As a result of the

chemical action inside a battery, water is lost. This should be replaced with distilled or demineralized water.

The level of electrolyte should be maintained at approximately 10mm above the plates unless otherwise specified by the manufacturer.

To provide the best service, a battery must be correctly charged. Both over- and undercharging can seriously affect its performance.

Measurement of capacity: For safety reasons, it is important that a small boat owner is able to determine the general condition of a battery and its ability to supply current over a period of time (its capacity). An indication of the level of charge in a battery maybe obtained by either:

?? Measuring the acid density of the electrolyte, or

?? Measuring the on-load terminal voltage.

Acid density measurement:

The relative density (specific gravity) of the electrolyte (liquid inside the battery) varies proportionally with the amount of charge in the battery. It is highest when the battery is fully charged, and lowest when the battery is fully discharged or flat. It follows that the amount of charge in a battery can be determined by measuring the density of the electrolyte.

A simple, inexpensive device called a hydrometer is used to measure density.

In general, for a fully charged Pb-acid battery, the relative density should measure about 1.250kg/L. Half charged will be indicated by a reading by 1.200kg/L and a fully discharged a reading of 1.150kg/L. All cells in a battery should indicate a similar relative density reading. A variation of more than about 0.025kg/L will indicate a faulty cell and the battery should be replaced.

On/off load voltage: Measurement of the terminal voltage when a battery is supplying current to a load, such as a radio, will also provide an indication of the amount of charge in a battery. This measurement is known as the on-load terminal voltage.

Measuring of the off-load terminal voltage (that is, when the battery is idle) is a poor indication of its condition.

Pb-battery hazards: there are 2 hazards associated with Pb-acid batteries that ship operators should be aware of:

?? The risk of explosion;

?? The risk of chemical burns.

As a result of the chemical process occurring within the cells of that battery during charging, H_2/O_2 gas is produced- When mixed with air, this can form a highly explosive mixture which can be ignited by a naked flame, a lighted cigarette, or a spark. The spark caused by breaking or making an electrical connection in the vicinity of the charging battery maybe sufficient to ignite the H_2-air mixture.

If using metal tools to work on battery connection, extreme care must be taken to ensure that terminals are not short-circuited.

The electrolyte in Pb-acid cells is H_2SO_4 and is sufficiently concentrated, particularly just after charging, to damage eyes, skin, or clothes if spilled or splashed. Immediate and prolonged application of running water is recommended to minimize its effects. Thus it is suggested that eye protection is worn when a person is carrying out maintenance on batteries. Batteries should not be toped-up whilst on charge.

Antenna faults: this may include:

?? Poor or broken connection in the antenna or radio earth system;

?? The antenna broken or shorted, or a fracture inside a whip antenna; and

?? Broken, deteriorated, contaminated insulators.

A poor or loose connection between the transceiver and the antenna will affect both transmitted and received signals. Received signals will be broken and the loudspeaker will “crackle”. Other stations may report broken transmitted signals. With MF/HF equipment, normal tuning positions on the antenna tuning unit (ATU) may vary.

A completely broken connection between transceiver and antenna will result in receiver hiss but few or no signal. Transmission will not be possible.

An antenna which is shorted to a vessels metallic hull or superstructure, is likely to produce similar results.

On vessels equipped with MF/HF equipment, faults occurring on the radio earthing system, although relatively uncommon may cause transmitting problems. The most likely faults are breaks in the metallic connections at the transceiver, ATU, or at the radio earth plate itself. On rare occasions, a radio plate may become detached from the hull.

Radio earthing problems will usually be evident by abnormal or changing ATU tuning positions. Often at faulty (or non-existent) radio earth may cause metallic parts of the transceiver and ATU to become ”live” during transmission. This is not dangerous but a sharp burning sensation may be felt when a direct contact with these parts.

Transceiver faults: A transceiver fault is usually obvious and probably will require specialist attention. A faulty microphone cord may prevent transmission, but not affect reception.

Power supply faults: this may include:

?? Loose or corroded battery terminals;
?? A discharged or defective battery;
?? Blown fuses; and
?? Loose or frayed connections cables.

Loose battery connections will be evident by intermittent operation of the receiver and transmitter, and flickering dial lights or channel display.

A battery which is defective or close to discharge may be able to supply sufficient current to operate the receiver, but not the transmitter. Should the transmitter fail to operate and dial lights or channel display dim significantly when the transmit button is operated, the batteries should be suspected. Heavy corrosion at the battery terminals may cause similar symptoms.

Blown fuses will mean that the equipment will fail to operate in any way. Frayed power supply cables touching together or to metal parts of the vessel are frequent cause of blown fuses.

Search and Rescue (SAR)

SAR coordination center location and operator, responsibilities for SAR coordination for small vessels: AusSAR is the division of the Australian Maritime Safety Authority (AMSA) in Canberra and is the operating authority for the Australian rescue coordination center Australia (RCC). RCC Australia has the responsibility for coordination of SAR operations in Australian waters.

A national plan involving both Commonwealth and State / Territory authorities delegates the responsibilities for the coordination for SAR operations for small vessels (pleasure, fishing vessels) to State / Territory police forces.

Resources available to State police forces: State / Territory police forces, using the resources of recognize marine rescue organizations such as the Australian volunteer coast guard, the royal volunteer coastal patrol and volunteer marine rescue, as well as their own water police, coordinate most in-shore boating emergencies.