

FCC ELEMENT ONE



EXAMINATION STUDY GUIDE

Introduction.

We seek to accomplish two important goals in the pages that follow:

- 1) To review the communications topics that have been identified as appearing on the examinations for all your Marine Radio Operators Permit and
- 2) To provide sufficient background and coverage for a qualified applicant who may desire or be required to pass the written examination for a Marine Radio Operator Permit.

The following radiotelephone communications topics may be on your examination:

Intro: Basic Types of Marine Radios VHF-AM / FM & Other Systems

FCC ELEMENT ONE SUBJECT MATERIAL; 47CFR Part 80

- 1) Equipment Requirements
- 2) License Requirements
- 3) Watchkeeping
- 4) Logkeeping
- 5) Log Entries
- 6) Misc Rules and Regulations
- 7) Bridge-to-Bridge Operations
- 8) Operating Procedures Part 1
- 9) Operating procedures Part 2
- 10) Distress Communications
- 11) Urgency and Safety Communications
- 12) GMDSS
- 13) VHF Equipment Controls
- 14) VHF Channel Selection
- 15) MF/HF Equipment Controls
- 16) MF/HF Frequencies and Emission Selection
- 17) Equipment Tests
- 18) Equipment Faults
- 19) Antennas
- 20) Power Sources
- 21) EPIRB's
- 22) SART
- 23) Survival Craft VHF
- 24) Navtex
- 25) Definitions

Test Questions from: FCC Commercial Element 1 Question Pool (approved 25 June 2009)

BASIC TYPES OF MARINE RADIOS - AM & VHF-FM - OTHER RADIO SYSTEMS

Radio communications are in a constant state of change and improvement.

In the early 1970s we passed through a period which witnessed a complete overhaul in our entire marine radio system.

Without going into details of the history and the technical differences behind these changes,

AM means 'amplitude modulation' and

FM stands for 'frequency modulation'.

These are simply different methods of producing radio sound emissions. [*Vocabulary - 'Emission' refers to the output of radio frequency energy.*]

For many years the marine radio system in almost universal use was the AM double side band (DSB) system. This type transmitter used a 'carrier wave which consumed about 50% of the set's power output. The voice sounds were produced by variances of amplitude on either side of this carrier frequency. One of the advantages of this system was the relatively low cost of the transceiver set. [*Vocabulary - Transceiver refers to a combined transmitter and receiver.*]

Although an AM signal reflecting off an upper layer of the atmosphere back to earth could carry around the world, most AM DSB; transmissions were limited by their power output to a reliable range of a few hundred miles. However, you could hear most of the vessels who were attempting to broadcast on the same frequency within this large area - a fact that jammed the frequency and denied reliable transmission to all but the most powerful or closest sets.

Some other disadvantages of the old DSB system were its high power consumption and associated high drain on batteries operating the transmitter, high noise and static levels, high levels of interference from other stations' transmissions and interference resulting from atmospheric conditions. The DSB system utilized frequencies between 2000 and 3000 kilohertz which still continue to be used by SSB (single side band) radios although the type of emission has changed. The calling and distress frequency, for example, was and still is 2182 kilohertz - which lies within the MF frequency range. However, no new station licenses for AM double side band (DSB) radios have been issued since January 1, 1972 and the system is now obsolete.

Replacing the old DSB system are two separate systems that take advantage of both amplitude modulation (AM) and frequency modulation (FM). As far as the radio operator was concerned there were few obvious differences in the new AM single side band (SSB) and the old AM double side band (DSB) radiotelephone other than the fact that the two systems were not really compatible with each other.

This is another way of saying that the differences were of a technical nature and were significant. Instead of transmitting a carrier wave and double side band, the new

technique broadcast no carrier wave and only one side band thereby increasing its efficiency by four or five times. As a result of these technical differences, everybody had to scrap their old DSB radios and purchase new sets. This was very costly, ran into much opposition, but has now been accomplished and put behind us.

There is less interference associated with the new system and more stations can occupy the limited number of assigned frequencies. Because of the reduced power requirement, the operating cost and the unit cost per Watt output of single side band (SSB) is a fraction of that of the old double side band sets (DSB). Under the new scheme of things, single side band radios are used only for long distance communications while VHF-FM sets are used for short range communications. *[Vocabulary - A Watt is a measure of electrical power. Volts X Amperes - Watts.]*

VHF-FM, often simply called 'VHF', stands for very high frequency - frequency modulation. Again the difference between FM and AM is mostly technical, but you should know some of the more significant differences. The most apparent difference between a SSB and a VHF radiotelephone is the fact that the VHF-FM set has an extremely short range. Since its waves do not 'bounce' off the ionosphere and back to earth, the range of VHF-FM transmission is limited to line of sight or to the distance of horizon regardless of the set's power output. This range varies with the height of the sending and receiving antennas but is normally limited to about twenty(20) to thirty(30)miles.

The short range of a VHF-FM radio has obvious disadvantages. Nevertheless, it is also a blessing in disguise since it allows a vessel beyond your horizon to transmit its messages on the same channel you are using without interfering with your communications. This means that many more stations can broadcast within the same geographic area without interfering with each other, one of the major drawbacks to the old DSB radios. However, you must use a single side band (SSB) radio rather than VHF set if you plan to make long range transmissions. VHF-FM sets have a relatively low initial cost compared to single side band (SSB), but you must have both types of radiotelephones if you need the capability for both long and short range communications.. Also, VHF-FM radios are free of atmospheric static.

The rules now require that the first radio system installed on board any vessel must be the VHF-FM system. That means that you can not install a SSB system until you first have a VHF system. Needless to say, you may install both systems at the same time. The VHF-FM radio is intended to provide for all your short range and 'Bridge-to-Bridge' communications and operate on selected channels using frequencies between 156 and 162 MegaHertz (MHz) with channel 16 or 156.800 MHz the calling-and-distress frequency for the Coast Guard and other vessels.

Authorities have long recognized that sounding certain specified signals on the ship's whistle, although adequate in the past, have exceeded their limits of usefulness.

As a result Congress finally passed legislation which requires 'bridge-to-bridge' radio capabilities on all power driven vessels over 300 gross tons, vessels over 100 tons carrying passengers for hire, tow boats over 26 feet in length and dredges and floating plants operating in or near a channel or fairway where they may affect the navigation of other vessels.

A VHF-FM radio is specified for bridge-to-bridge communications utilizing channel 13 and certain other designated channels in the 156-162 MHz band with a normal operating output of only 1 Watt and a maximum power of 25 Watts.

The 'bridge-to-bridge' radio must be located at the principal control station of the vessel and is reserved for the exclusive use of the Master or the person designated by him to operate the vessel - with voice communications further restricted to persons who are able to speak and understand the English language. The voice procedure on the bridge-to-bridge radio is basically the same as on any other radio; i.e. identify your vessel - omitting call signs for speed of communications, propose a course of action, and await a reply from the approaching vessel.

If you do not receive a response to your second call, you may increase output power above 1 Watt and call again. You may also transmit on increased power in an emergency or when rounding a blind bend in a river where your signal might be partially blocked by the terrain. Presumably, the vessel which normally initiates a whistle signal - such as an overtaking vessel - would also initiate the radio communication. However, the fact that you have made radio contact with another vessel in no way relieves you of the responsibilities of complying with all the rules of the road including the sounding of whistle signals. There is no standardization of wording on the bridge-to-bridge frequency, but you will usually hear something like: "I propose to pass you port to port" or "I propose to pass you on your starboard side", or even "I propose to pass on the two whistle side".

Procedures words (i.e. 'prowords') are words and phrases that are used to speed the transmission of messages by radiotelephone. These prowords are commonly used in the maritime mobile service. A list of these prowords is given below.

- '**Break**' – I must break into this conversation;
- '**Calling**' – I wish to speak to...
- '**This is**' – Your vessel name or call sign..
- '**Over**' - Go ahead, or this is the end of my transmission and a reply is necessary.
- '**Please Acknowledge**' – Indicate that you have received what I have just sent..
- '**How do you Read**' – How well are you receiving me?
- '**Affirmative**' – Yes,
- '**Negative**' – No
- '**Thank You**' – Gratitude
- '**Nothing More**' – I have finished my message, you are free to change subject or terminate..
- '**Correction**' – I have just made a mistake in this transmission; the information should be....
- '**say again**' - I am repeating the transmission or portions indicated.
- '**Understood**' – I receive the following information which I shall now read back to you..
- '**Switch to VHF channel**' – I suggest that we switch to channel...
- '**Stay On**' – Do not terminate this conversation or change the subject because I have more to say...
- '**Out**' - End of transmission; no receipt required.
- '**Sorry**'- Apology
- '**Silence**' - Emergency silence sign.
- '**Silence FINI**' - Resume normal transmission.
- '**Unknown Ship or Station** - Unknown ship /station.I wish to make contact with you..
- '**Wait**' - I must pause a few seconds. Do not terminate call, or Wait One (1 minute)
- '**Securite**' – Security call of a safety nature, navigation or weather.
- '**Pan- Pan**' – Urgency call, concerning the safety of a mobile unit or person.

This is the end of the basic introduction to Marine Radio. The following pages are layed out the same as the question pool from the FCC. We have attached a copy of the question pool to the end of this study guide, this pool of questions are the latest from the FCC, the date of the pool is 2009 FCC Commercial Element 1 (approved 25 June 2009).

Most all of the information is from 47CFR-Part 80 and other Pub used is Pub 102.

Underline text refers to possible test answers.

1) Equipment Requirements:

This vary's greatly, are you a Recreational craft, small fishing boat, small passenger boat or a large commerical vessel, large passenger vessel etc.

And / Or

If you ARE; only operating in the US (inland waters), or travel to a foreign port.

Note: IAW (in accordance with) **47CFR80.203(a)** all equipment used in the maritime services must be certificated by FCC as of part 80. See Subpart E General Technical Standards.

So let's look at the Recreational craft first, that will not travel passed the Demarcation lines.

1. IAW (in accordance with) **33 CFR 26.03 Bridge-to-Bridge**, inside of Demarcation lines.

(a) Unless an exemption is granted under 26.09 and except as provided in paragraph (a) (4) of this section, this part applies to;

(1) Every vessel power-driven vessel of 20 meters (65.5ft) or over in length while navigating;

(2) Every vessel of 100 gross tons and upward carrying one or more passengers for hire while navigating;

(3) Every towing vessel of 26 feet or over in length while navigating;

(4) Every dredge and floating plant engaged in or near a channel or fairway in operations likely to restrict or affect navigation of other vessels except for an unmanned or intermittenly manned floating plant under the control of a dredge.

Note: This does not address GMDSS for required equipment carriage for sea area A1 and A2. See section 12 of this manual.

(b) Every vessel, dredge, or floating plant described in paragraph (a) of this section must have a radiotelephone on board capable of operation from its navigational bridge, or in the case of a dredge, from its main control station., and capable of transmitting and receiving on the frequency or frequencies within the 156-162 Mhz band using the classes or emissions designated by the FCC for the exchange of navigational information.

(c) The radiotelephone required by paragraph (b) of this section must be carried on board the described vessel, dredge, and floating plant upon the navigable waters of the U.S.

(d) The radiotelephone required by paragraph (b) of this section must capable of transmitting and receiving on VHF FM channel 22A (157.1 Mhz).

(e) While transiting any of the following waters, each vessel described in paragraph (a) of this section also must have on board a radiotelephone capable of transmitting and receiving on VHF FM channel 67 (156.375 Mhz):

Note: paragraph (e) is talking about VTS and the table located in Colregs72 pages 211 and 212, also that a single VHF FM that is capable of scanning or monitoring more than one frequency (dual-watch) will not meet the requirement for two radios.

2. LICENSE REQUIREMENTS;

We will now look at license requirements for your vessel, remember are you the owner or the operator, or have you rented the vessel for the day or just part of the crew. Is your vessel a "Voluntary Vessel", how many passengers will you carry etc.

Area of operations, are you in international waters as A1, A2. Will you communicate by VHF DSC, MF/HF DSC, or Inmarsat (satellite).

47CFR80.13 Station License Required:

Except as noted in paragraph (c) of this section, stations in the maritime service must be licensed by the FCC either individually or by fleet. (note; they are referring to vessels, not people)

(b) One ship station license will be granted for operation of all maritime services transmitting equipment on board a vessel. Radiotelephone and narrow-band directing printing equipment will not be authorized, however, unless specifically requested by the applicant.

(c) A ship station is licensed by rule and does not need an individual license issued by the FCC if the ship is not subject to the radio requirement carriage requirements any statute, treaty or agreement to which the U.S. is signatory, the ship station does not travel to foreign ports, and the ship station does not make international communications. A ship station licensed by rule is authorized to transmit radio signals using a marine radio operating in the 156-162 Mhz band, any type of EPIRB, and any type of radar installation. All other transmissions must be authorized under a ship station license. Even though an individual license is not required, a ship station licensed by rule must be operated in accordance with all applicable operating requirements, procedures, and technical specifications found in the part.

Note; If your vessel does not qualify in section 1 of this manual you are not required to have a license. Even if you have a VHF FM radio.

47CFR80.15(d) Eligibility for station license:

A ship station license may only be granted to;

- (1.) The owner or operator of the vessel
- (2.) A subsidiary communications corporation of the owner or operator of the vessel.
- (3.) A state or local government subdivision or
- (4.) Any agency of the U.S. Government subject to section 301 of the Communications Act.

47CFR80.17(a)(4) Administrative classes of stations:

The ship station license may include authority to operate other radio station classes aboard ship such as; radionavigation, on-board, satellite, EPIRB, radiotelephone, radiotelegraph, and survival craft.

47CFR80.25(a) License term:

Licenses for ship stations in the maritime services will normally be issued for a term of ten years from the date of original issuance, or renewal.

47CFR80.151 Classification of Operator license and endorsements

(5) MP. Marine Radio Operator Permit.

47CFR80.155 SHIP STATION OPERATOR REQUIREMENTS

Except as provided in 80.177 and 80.179 operation of transmitters of any ship station must be performed by a person holding a commercial radio license or permit of the class required below. The operator is responsible for proper operation of the station.

47CFR80.156 Control by Operator;

The operator on board ships required to have a holder of a commercial operator license or permit on board may, if authorized by the station licensee or master, permit an unlicensed person to modulate the transmitting apparatus for all modes of communication except Morse code radiotelegraphy.

47CFR80.159 Operator requirements of Title III of the Communication Act and the Safety Convention.

(a) Is for Passenger ships with telegraph.

(b) Is for Cargo ships with telegraph

(c) Is for Cargo ships with radiotelephones

(d) Each passenger ship equipped with a GMDSS installation in accordance with sub-part W of this part shall carry at least two persons holding an appropriate GMDSS Radio Operator License or, if the passenger ship operates exclusively within twenty nautical miles of shore, at least two persons holding either a GMDSS Radio Operator License or a Restricted GMDSS Radio Operator License, as specified in 13.7 of this chapter.

47CFR80.161 Operator requirements of the Great Lakes Radio Agreement.

Each ship subject to the Great Lakes Radio Agreement must have on board an officer or member of the crew who holds a marine radio operator permit or higher class license.

47CFR80.163 Operator requirements of the Bridge-to-Bridge Act.

Each ship subject to the Bridge-to-Bridge Act must have on board a radio operator who holds a restricted radio telephone operator permit or higher class license.

47CFR80.165 Operator requirements Voluntary Stations.

Minimum Operator License

MP- Ship direct-printing telegraph

MP- Ship telephone with or without DSC (digital select calling), not more than 100 watts carrier power or 400 watts PEP(peak envelope power).

47CFR80.177 When operator license is **NOT** required.

- (a) No radio operator authorization is required to operate:
 - (2) A survival craft station or an emergency position indicating radio beacon;
 - (3) A ship radar station if:
 - (i) The radar frequency is determined by a nontunable, pulse type magnetron or other fixed tuned device, and
 - (ii) The radar is capable of being operated exclusively by external controls;
 - (4) An on board station; or
 - (5) A ship station operating in the VHF band on board a ship voluntarily equipped with radio and sailing on a domestic voyage.
- (b) No radio operator license is required to install a VHF transmitter in a ship station if the installation is made by, or under the supervision of, the licensee of the ship station and if modifications to the transmitter other than the front panel controls are not made.
- (d) No radio operator license is required to install a radar station on a voluntarily equipped ship when a manual is included with the equipment that provides step-by-step instructions for the installation, calibration, and operation of the radar. The installation must be made by, or under the supervision of the licensee of that ship station and no modifications or adjustments other than to the front panel controls are to be made to the equipment.

3. WATCHKEEPING;

Ship station Safety Watches, we will first look at compulsory ship, than voluntary vessels.

Compulsory Vessels: (see note at the bottom of page)

47CFR80.304 Watch Requirement during silence periods.

Each ship station operating on telephony on frequencies in the band 1605-3500 khz must maintain a watch on frequency 2182 khz. This watch must be maintained at least twice each hour for 3 minutes commencing at x h.00 and x h.30 Coordinated Universal Time (UTC) using either a loudspeaker or headphone. Expect for distress, urgency or safety messages, ship stations must not transmit during the silence periods on 2182 khz.

47CFR80.305 Watch requirements of the Communication Act and the Safety Convention;

(a) Each ship of the United States which is equipped with a radiotelegraph station, keep a continuous and efficient watch on 500 khz by means of radio officers while being navigated in the open sea outside a harbor or port. This watch must be maintained at least twice each hour for 3 minutes commencing at x h.15 and x h.45 Coordinated Universal Time (UTC) using either a loudspeaker or headphone. Expect for distress, urgency or safety messages, ship stations must not transmit during the silence periods on 500 khz.

Note: Due to GMDSS the above SILENCE PERIODS are no longer required, first the GMDSS equipment scans all required frequencies, and 500 khz (Morse Code) is NO LONGER in use.

The FCC still ask's questions about these SILENCE PERIODS, this is the only reason they are in this manual.

47CFR80.305(3) Until Feb 1, 2005, a continuous and efficient watch on the VHF distress frequency 156.800 Mhz (channel 16) from the room from which the vessel is normally steered while in the open sea outside a harbor or port.

By a designated member of the crew who may perform other duties, related to the operation or navigation of the vessel.

Each ship of the United States transporting more than six passengers for hire, which is equipped with a radiotelephone station, must, while being navigated in the open or any tidewater within the jurisdiction of the United States adjacent or contiguous to the open sea, keep a continuous and efficient watch on 2182 khz while the vessel is beyond VHF communication range of the nearest VHF coast station(*note sea areas A2,A3,A4*), whenever the radiotelephone station is not being used for authorized traffic. A VHF watch must be kept on 156.800 Mhz(channel16) whenever such station is not being used for authorized traffic.

The VHF watch must be maintained at the vessel's steering station actually in use by the qualified operator as defined by 80.157 or by a crewmember who may perform other duties relating to the operation or navigation of the vessel.

This watch **NEED NOT BE MAINTAINED** by vessels subject to the Bridge-to-Bridge Act (channel 13) and participating in a Vessel Traffic Services (VTS) system as required or recommended by the U.S. Coast Guard, when an efficient listing watch is maintained on both the bridge-to-bridge frequency and a separate assigned VTS frequency.

47CFR80.310 Watch required by Voluntary Vessels: Voluntary vessels NOT equipped with DSC must maintain a watch on 156.800 Mhz (channel 16) whenever the vessel is underway and the radio is not being used to communicate. Noncommercial vessels, such as recreational boats, may alternatively maintain a watch on 156.450 Mhz (channel 9) for call and reply purposes.

Voluntary vessels equipped with VHF-DSC equipment must maintain a watch on either 156.525 Mhz (channel 70) or VHF channel 16 aurally when the vessel is underway and the radio is not being used to communicate.

Voluntary vessels equipped with MF-HF DSC equipment must have the radio turned on and set to an appropriate DSC distress calling channel or one of the radiotelephone distress channels whenever the vessel is underway and the radio is not being used for communicate.

Voluntary vessels equipped with Inmarsat A,B, or C systems must have the unit turned on and set to receive calls whenever the vessel is underway and the radio is not being used to communicate.

4. LOG KEEPING;

IAW 47 CFR80.409 Station Logs (see table 47CFR80.401)

General requirements; Logs must be established and properly maintained as follows;

(1) The log must be kept in an orderly manner. The required information for the particular class or category of station must be readily available, Key letters or Abbreviations may be used if their proper meaning or explanation is contained elsewhere in the same log.

(2) Erasures, obliterations or willful destruction within the retention period are prohibited. Corrections may be made only by the person originating the entry by striking out the error, initialing the correction and indicating the date of correction.

(3) Ship station logs must indentify the vessel name, country of registry, and official number of the vessel.

(4) The station licensee and the radio operator in charge of the station are responsible for the maintenance of station logs.

(b) Availability and retention; Station logs must be made available to authorized Commission employees upon request and retained as follows;

(1) Logs must be retained by the licensee for a period of two years from the date of entry, and, when applicable, for such additional period as required by the following paragraphs:

(i) Logs relating to a distress situation or disaster must be retained for three years from the date of entry.

(ii) If the Commission has notified the licensee of an investigation, the relating logs must be retained until the licensee is specifically authorized in writing to destroy them.

(iii) Logs relating to any claim or complaint of which the station licensee has notice must be retained until the claim or complaint has been satisfied or barred by statute limiting the time for filing suits upon such claims.

(2) Logs containing entries required by paragraphs (e) and (f) of this section must be kept at the principle radio telephone operating location while the vessel is being navigated. All entries in their original form must be retained on board the vessel for at least 30 days from the date of entry. Additionally, logs required by paragraph (f) of this section must be retained on board the vessel for period of 2 years from the date of the last inspection of the ship radio station.

5. LOG ENTRIES;

IAW 47CFR80.409(e) Ship radiotelephone logs(note:GMDSS logs NOT included.)

(e) Logs of ship stations which are compulsorily equipped for radiotelephony must contain the following applicable log entries and the time of their occurrence: read following note:

(IAW Supart X Voluntary Radio Installations 47CFR80.1153 Station log and radio watches;

(a) Licensees of voluntary ships are NOT required to operate the ship radio station or to maintain radio station logs.

(b)When a ship radio station of a voluntary ship is being operated, appropriate general prupose watches MUST be maintain in accordance with 80.146(Reserved), 80.147 Watch on 2182khz, 80.148 Watch on 156.8Mhz Channel 16.)

(1) A summary of all distress communications heard, and urgency communications affecting the station's own ship.

(2) A summary of safety communications on other than VHF channels affecting the stations own ship.

(3) An entry that pre-departure equipment checks were satisfactory and that required publications are on hand. Daily entries of satisfactory tests to ensure the continued proper functioning of GMDSS equipment shall be made.

(4) An entry describing any malfunctioning GMDSS equipment and another entry when the equipment is restored to normal operation.

(5) A weekly entry that:

(i) The proper functioning of digital selective calling (DSC) equipment has been verified by actual communications or a test call;

(ii) The batteries or other reserve power sources are functioning properly;

(iii) The portable survival craft radio gear and radar transponders have been tested; and

(iv) The EPIRBs have been inspected. (note; monthly test is required)

(6) The time of any inadvertent transmissions of distress, urgency, and safety signals including the time and method of cancellation.

6. MISC RULES & REGs;

It is **illegal** to operate a radio station (the radio on your vessel) unless that radio station is operated in accordance with the applicable laws and regulations. As a licensed marine radio operator, you should understand that the regulations require most types of radio stations to be licensed.

IAW 47CFR80.114 Authority of the Master;

(a) The service of each ship station must at all times be under the ultimate control of the Master, who must require that each operator or such station comply with the Radio Regulations in force and that the ship station is used in accordance with those regulations.

Willful or repeated operation of an unlicensed radio station in violation of the rules can be punished by fines or imprisonment. An unlicensed person may transmit / use the radio, but only under the licensed operator supervision.

An operator holding an appropriate license or permit is required to operate a ship's radio station transmitter unless that station is on a vessel **'voluntarily equipped'** (i.e. not required to be equipped by a treaty, law or regulation) with a VHF radio.

As a licensed Marine Radio Operator you are responsible for the **proper operation** of your station. As of 47CFR part 80 and if you travel in international water, the International Radio Regulations at the US is party to.

47CFR80.79 Inspection by Foreign Government; If you are the radio operator of a vessel equipped with a radio station, you must allow the appropriate officials of the government of a foreign country which the vessel enters to examine your radio station license upon request.

Furthermore, you must cooperate and assist in this examination if requested to do so. If the license is not available or if other irregularities are discovered, the officials of

the foreign government may inspect the radio station itself to satisfy themselves that it complies with the International Radio Regulations.

All **adjustments of radiotelephone transmitting equipment** in any maritime coast or ship station, made during the installation, servicing, or maintenance of that equipment, and which may affect its proper operation, may only be made by, or under the immediate supervision of, a person who holds a proper certificate or license to do so.

Except for broadcasts intended for public reception, or distress messages, you may not disclose the existence or content of any radio communication to any person except the party to whom the communication is addressed. This means that if you are sending a private message for someone on your vessel or are supervising a radiotelephone conversation by a passenger or crewmember, you must not reveal to anyone, other than the coast or ship station you are communicating with, either the existence or content of the communication. If you happen to overhear a radio communication which is not addressed to you, you must not tell anyone what you heard unless the communication was from a ship or aircraft in distress. Furthermore, it is **illegal** for you to use the content of any intercepted communication for your own benefit, or for the benefit of someone else who is not entitled to the information.

For inspection of a ships GMDSS radio station you will need to contact the nearest Engineer-in-Charge of the FCC District Office where the inspection is to take place.

As for vessels that are required to carry radio equipment on international voyages under SOLAS are Cargo ships of 300 GT and Passenger vessel that has 12 or more.

7. BRIDGE-TO-BRIDGE OPERATIONS

IAW 33CFR Part 26

The purpose of this Act is to ensure communication between vessels on channel 13 VHF radiotelephony. The VHF radio station is located on the navigational bridge from which the vessel is controlled.

The information transmitted must be navigational and safety communications between other vessels and Vessel Traffic Service (VTS).

You can call other vessels by their call sign or name, and in the event that the other vessel is not responding to calls, you can switch to high power (25 watt). This high power transmitter will help if you are entering a bend in the river and need to warn other of your approach, or broadcasting a distress message.

The above are general statements that are founded in the CFR's. Example:

33CFR26.02 states: *Vessel Traffic Service (VTS)* means a service implemented under Part 161 of this chapter by the United States Coast Guard designed to improve the safety and efficiency of vessel traffic and to protect the environment. The VTS has the capability to interact with marine traffic and respond to traffic situations developing in the VTS area.

33CFR26.04(d)(e) states:(d) On the navigable waters of the United States, channel 13 (156.65 MHz) is the designated frequency required to be monitored in accordance with 26.05(a) except that in the area prescribed in 26.03(e), channel 67 (156.375 MHz) is the designated frequency.

(e) On those navigable waters of the United States within a VTS area, the designated VTS frequency is an additional designated frequency required to be monitored in accordance with 26.05.

47CFR80.331(c) states: (c) Use of power greater than 1 watt in a bridge-to-bridge station shall be limited to the following three situations:

- (1) Emergency.
- (2) Failure of the vessel being called to respond to a second call at low power.
- (3) A broadcast call as in paragraph (a)(1) of this section in a blind situation, e.g. rounding a bend in a river.

8. OPERATING PROCEDURES PART 1; 47CFR80.86 Operating Procedures— General

In addition to being regulated by these rules (47CFR Part 80) the use and operation of stations subject to this part are governed by the Radio Regulations and the radio provisions of all other international agreements in force to which the United States is a party.

47CFR80.87: Each radio channel is available for use on a share basis only and is not available for the exclusive use of any one station or station licensee. Station licensees must cooperate in the use of their respective frequency assignments in order to minimize interference and obtain the most effective use of the authorized radio channels.

47CFR80.67 General facilities requirements for coast station

(a) All coast stations licensed to transmit in the band 156-162 MHz must be able to transmit and receive on 156.800MHz (channel 16) and at least one working frequency in the band.

(b) All coast stations that operate telephony on frequencies in the 1605-3500kHz band must be able to transmit and receive using J3E emissions on the frequency 2182kHz and at least one working frequency in the band.

47CFR80.108: A coast station may transmit, at intervals, list of call signs in alphabetical order for which they have traffic on hand. These traffic lists will be transmitted on the station's normal working frequencies at intervals of:

(1) In the case of telegraphy, at least two hours and not more than four hours during the working hours of the coast station.

(2) In the case of radiotelephony, at least one hour and not more than four hours during the working hours of the coast station.

(b) The announcement must be as brief as possible and must not be repeated more than twice. Coast stations may announce on a calling frequency that they are about to transmit call lists on a specific working frequency.

47CFR80.91 Order of priority of communications.

(a) All stations in the maritime mobile service and the maritime mobile-satellite service shall be capable of offering four levels of priority in the following order:

- (1) Distress calls, distress messages, and distress traffic.
- (2) Urgency communications.
- (3) Safety communications.
- (4) Other communications.

(b) In a fully automated system, where it is impracticable to offer all four levels of priority, category 1 shall receive priority until such time as intergovernmental agreements remove exemptions granted for such systems from offering the complete order of priority.

9. OPERATING PROCEDURES PART 2;

47CFR80.92 Prevention of interference:

(a) The station operator must determine that the frequency is not in use by monitoring the frequency before transmitting, except for transmission of signals of distress.

(b) When a radiocommunication causes interference to a communication which is already in progress, the interfering station must cease transmitting at the request of either party to the existing communication. As between nondistress traffic seeking to commence use of a frequency, the priority is established under 80.91.

(c) Except in cases of distress, communications between ship stations or ship and aircraft stations must not interfere with public coast stations. The ship or aircraft stations which cause interference must stop transmitting or change frequency upon the first request of the affected coast station.

47CFR80.102 Radiotelephone station identification.

This section applies to all stations using telephony which are subject to this part.

(a) Except as provided in paragraphs (d) and (e) of this section, stations must give the callsign in English. Identification must be made:

- (1) At the beginning and end of each communication with any other station.
- (2) At 15 minute intervals when transmission is sustained for more than 15 minutes.

When public correspondence is being exchanged with a ship or aircraft station, the identification may be deferred until the completion of the communications.

47CFR80.116 Radiotelephone operating procedure for ship stations:

(a) Calling a Coast station. (1) Use by ship stations of the frequency 2182kHz for calling coast stations and for replying to calls from coast stations is authorized. HOWEVER, such calls and replies should be on the appropriate ship-shore working frequency.

(2) Use by ship stations and marine utility stations of the frequency 156.800MHz (channel 16) for calling coast stations and marine utility stations on shore, and for replying to calls from such stations, is authorized. HOWEVER, such calls and replies should be made on the appropriate ship-shore working frequency.

(b) Calling ship stations. (1) Except when other operating procedure is used to expedite safety communication, ship stations, before transmitting on the intership working frequencies 2003, 2142, 2638, 2738, or 2830 kHz, must first establish communications with other ship stations by call and reply on 2182 kHz. Calls may be initiated on an intership working frequency when it is known that the called vessel maintains a simultaneous watch on the working frequency and on 2182 kHz.

(2) Except when other operating procedures are used to expedite safety communications, the frequency 156.800 MHz (channel 16) must be used for call and reply by ship stations and marine utility stations before establishing communication on one of the intership working frequencies. Calls may be initiated on an intership working frequency when it is known that the called vessel maintains a simultaneous watch on the working frequency and on 156.800MHz (channel 16).

(c) Change to working frequency. After establishing communication with another station by call and reply on 2182kHz or 156.800MHz(channel 16) stations on board ship must change to an authorized working frequency for the transmission of messages.

(d) Limitations on calling Calling a particular station must not continue for more than 30 seconds in each instance. If the called station does not reply, the station must not again be called until after an interval of 2 minutes. When a called station called does not reply to a call sent three times at intervals of 2 minutes, the calling must cease and must not be renewed until after an interval of 15 minutes: HOWEVER, if there is no reason to believe that harmful interference will be caused to other communications in progress, the call sent three times at 2 minute intervals may be repeated after a pause of not less than 3 minutes. In event of an emergency involving safety, the provisions of this paragraph DO NOT APPLY.

(e) Limitations on working. Any one exchange of communications between any two ship stations on 2003, 2142, 2638, 2738, or 2830 kHz or between a ship station and a private coast station on 2738 or 2830 kHz must not exceed 3 minutes after the stations have established contact. Subsequent to such exchange of communications, the same two stations must not again use 2003, 2142, 2638, 2738, or 2830 kHz for communication with each other until 10 minutes have elapsed.

(f) Transmission limitation on 2182 kHz and 156.800MHz To facilitate the reception of distress calls, all transmissions on 2182kHz and 156.800MHz(channel 16) must be minimized and transmissions on 156.800MHz must not exceed 1 minute.

(g) Limitations on commercial communication. On frequencies in the band 156-162 MHz the exchange of commercial communication must be limited to the minimum practicable transmission time. In the conduct of ship-shore communication other than distress, stations on board ship must comply with instructions given by the private coast station or marine utility station on shore with which they are communicating.

Pub 102 Letter / Code Word / International Phonetic Alphabet

Phonetic Tables for the pronunciation of letters and figures by radiotelephony

Note: The **Boldfaced** syllables are emphasized.

| <i>Letter</i> | LETTER SPELLING TABLE <i>Code Word</i> | <i>Pronunciation</i> |
|---------------|--------------------------------------------------|---------------------------|
| A | Alfa | AL FAH |
| B | Bravo | BRAH VOH |
| C | Charle | CHAR LEE |
| D | Delta | DELL TAH |
| E | Echo | ECK OH |
| F | Foxtrot | FOKS TROT |
| G | Golf | GOLF |
| H | Hotel | HOH TELL |
| I | India | IN DEE AH |
| J | Juliett | JEW LEE ETT |
| K | Kilo | KEY LOH |
| L | Lima | LEE MAH |
| M | Mike | MIKE |
| N | November | NO VEM BER |
| O | Oscar | OSS CAH |
| P | Papa | PAH PAH |
| Q | Quebec | KEH BECK |
| R | Romeo | ROW ME OH |
| S | Sierra | SEE AIR RAH |
| T | Tango | TANG GO |
| U | Uniform | YOU NEE FORM |
| V | Victor | VIK TAH |
| W | Whiskey | WISS KEY |
| X | X-ray | ECKS RAY |
| Y | Yankee | YANG KEY |
| Z | Zulu | ZOO LOO |

10. DISTRESS COMMUNICATIONS;(note; will cover only radio distress calls)**Distress signals**

47CFR80.311: A mobile station in distress may use any means at its disposal to attract attention, make known its position, and obtain help. A distress call and message, HOWEVER, must be transmitted only on the authority of the master or person responsible for the mobile station. No person shall knowingly transmit or cause to be transmitted, any false or fraudulent signal of distress or related communication. A distress call indicates a vessel or aircraft is threatened by a **grave and imminent danger** and **requests immediate assistance**.

47CFR80.312: Such a call has **absolute priority** over all other transmissions. All stations which hear a distress call must immediately cease any transmission capable of interfering with the distress traffic and continue to listen on the frequency used by the distress call. Distress calls must not be addressed to a particular station, and acknowledgement of their receipt must not be given before the distress message which follows it is sent.

Radiotelephone distress communications include the following steps:

(1) The radiotelephone alarm signal - if such an alarm is installed and is operational. This automatic signal consists of two audio tones with different pitches transmitted alternately; its purpose is to attract the attention of persons on radio watch or to trigger automatic alarm devices. You may only use this alarm to announce that a distress call or distress message is about to follow. Note: this is VOICE communications

(2) The **distress call** consists of....

- The distress signal MAYDAY (spoken three times); The words THIS IS (spoken once);
- The call sign or name of the vessel in distress (spoken three times).

(3) The **distress message** follows immediately and consists of:

- The distress signal MAYDAY;
- The call sign and name of the vessel in distress;
- Its position in latitude and longitude or true bearing and distance from a known geographical position;
- The nature of the distress;
- The kind of assistance desired;
- The number of persons on board (POB) and the condition of any injured;
- Present seaworthiness of the vessel;
- A description of the vessel including her length, type, cabin, masts, power, color of hull, superstructure, trim, etc.;
- Any other information which might simplify the rescue, such as displaying a surface-to-air identification signal or a radar reflector;
- Your listening frequency and schedule;
- THIS IS (call sign and name of vessel in distress). *OVER*.

47CFR80.321

(a) **Acknowledgement of receipt of a distress message.** If you receive a distress message from a vessel which is definitely in your vicinity, DONOT (*change to this is that your are to wait 5 minutes*) immediately acknowledge its receipt. If the vessel is not in your vicinity, allow a short interval of time to elapse before acknowledging so that vessels closer to the vessel in distress can acknowledge receipt without interference. However, in areas where reliable communications with one or more shore stations are practicable, all vessels MUST defer their acknowledgement for a short interval so that a shore station may acknowledge receipt first. The acknowledgement of receipt of a distress call is given as follows:

- The call sign or name of the vessel sending the distress (spoken three times);
- The words THIS IS;
- The call sign or name of acknowledging vessel (spoken three times);
- The words RECEIVED MAYDAY.

47CFR80.322 Form of acknowledgement

After the above acknowledgement, allow a momentary interval of listening to insure that you will not interfere with another vessel better situated to render immediate assistance; if not, with the authority of the person in charge of the vessel, transmit:

- The word MAYDAY;
- The call sign and name of distressed vessel; The words THIS IS;
- The call sign and name of your vessel;
- Your position in latitude and longitude, or true bearing and distance from a known geographical position; The speed you are proceeding towards, and the approximate time it will take you to reach, the distressed vessel. OVER.

47CFR80.323

(a) **Further distress messages and other communications:** Distress communications consist of all messages relating to the immediate assistance required by the distressed vessel. Each distress communication must be preceded by the signal 'MAYDAY. The vessel in distress or the station in control of distress communications may impose silence on any station which Interferes. The procedure is: the words SEELONCE MAYDAY (Seelonce is French pronunciation for silence). Silence also may be imposed by nearby mobile stations other than the vessel in distress or the station in control of distress communications. The mobile station which believes that silence is essential may request silence by the following procedure: the word SEELONCE, followed by the word DISTRESS, and its own call sign.

47CFR80.324

(a) **Transmission of the distress procedure by a vessel or shore station not itself in distress:** A vessel or a shore station which learns that a vessel is in distress shall transmit a distress message in any of the following cases:

- When the vessel in distress is not itself able to transmit the distress message.
- When a vessel or a shore station considers that further help is necessary.

- When, although not able to render assistance, it heard a distress message that was not acknowledged.
- In these cases, the transmission must consist of:
- The radiotelephone alarm signal (if available);
- The words MAYDAY RELAY (spoken three times); The words THIS IS;
- The call sign and name of vessel or shore station, (spoken three times).

When a vessel transmits a distress message under these conditions, it must take all necessary steps to contact the Coast Guard or a shore station which can notify the Coast Guard. (7) Termination of distress: When distress traffic has ceased, or when silence is no longer necessary on the frequency used for the distress traffic, the station in control must transmit on that frequency a message to all stations as follows:

- The distress signal MAYDAY;
- The call TO ALL STATIONS, spoken three times;
- The words THIS IS;
- The call sign and name of the station sending the message;
- The time;
- The name and call sign of the vessel in distress;
- The words SEELONCE FEENEE (French for silence finished).

The above has reviewed the voice procedures in use on VHF-FM and MF/HF radios, but you may have the Digital Selective Calling (DSC) on your VHF-FM radio or other radio equipment.

DSC equipment came into use when GMDSS was mandated by the International Maritime Organization (IMO) for compulsory vessels with voyages in international waters.

We will cover this in chapter 12. GMDSS.

11. URGENCY & SAFETY COMMUNICATIONS;

47CFR80.327 Urgency signals.

(a) The urgency signal indicates that the calling station has a very urgent message to transmit concerning the safety of a ship, aircraft, or other vehicle, or the safety of a person. The urgency signal must be sent only on the authority of the master or person responsible for the mobile station.

(b) In radiotelegraphy, the urgency signal consists of three repetitions of the group XXX, sent with the individual letters of each group, and the successive groups clearly separated from each other. It must be transmitted before the call.

(c) In radiotelephony, the urgency signal consists of three oral repetitions of the group of words PAN PAN transmitted before the call.

(d) The urgency signal has priority over all other communications except distress. All mobile and land stations which hear it must not interfere with the transmission of the message which follows the urgency signal.

47CFR80.328 Urgency Message.

- (a) The urgency signal and call and the message following it, must be sent on one of the international distress frequencies. Stations which cannot transmit on a distress frequency may use any other available frequency on which attention might be attracted.
- (b) Mobile stations which hear the urgency signal must continue to listen for at least three minutes. At the end of this period, if no urgency message has been heard, they may resume their normal service. HOWEVER, land and mobile stations which are in communication on frequencies other than those used for the transmission of the urgency signal and the call which follows it may continue their normal work without interruption provided the urgency message is not addressed "to all stations".
- (c) When the urgency signal has been sent before transmitting a message "to all stations" which calls for action by the stations receiving the message, the station responsible for its transmission must cancel it as soon as it knows that action is no longer necessary. This message of cancellation must likewise be addressed "to all stations".

47CFR80.329 Safety signals

- (a) The safety signal indicates that the station is about to transmit a message concerning the safety of navigation or giving important meteorological warnings.

Note: in 80.141 special procedures-Ship Stations (b)(2) Every ship, on meeting with any direct danger to the navigation of other ships such as ice, a derelict vessel, a tropical storm, subfreezing air temperatures associated with gale force winds causing severe icing on superstructures, or winds of force 10 or above on the Beaufort scale for which no storm warnings has been received must transmit related information to ships in the vicinity and to the authorities on land unless such action has already been taken by another station. All such radio messages must be preceded by the safety signal.

- (b) In radiotelegraphy, the safety signal consist of three repetitions of the group TTT, sent with the individual letters of each group, and the successive groups clearly separated from each other. It must be sent before the call.
- (c) In radiotelephony, the safety signal consist of the word SECURITE, pronounced as in French, spoken three times and transmitted before the call.
- (d) The safety signal and call must be sent on one of the international distress frequencies (8364 kHz radiotelegraphy, 2182 kHz or 156.8 MHz radiotelephone). Stations which cannot transmit on a distress frequency may use any other available frequency on which attention might be attracted.

47CFR80.330 Safety message

- (a) The safety signal and call must be followed by the safety message. Where practicable, the safety message should be sent on a working frequency, and a suitable announcement to this effect must be made at the end of the call.
- (b) Except for the cases mentioned in paragraph (c) of this section, the safety signal must be sent on the frequency 500 kHz (no longer in use) must be transmitted toward the end of the first available silence period: the safety message must be transmitted immediately after the silence period.
- (c) Messages about meteorological warnings, of cyclones, dangerous ice, dangerous wrecks, or any other imminent danger to marine navigation must be preceded by the safety signal.
- (d) Stations hearing the safety signal must not make any transmission likely to interfere with the message.

12. GMDSS (Global Maritime Distress and Safety System)

The basic concept of the GMDSS is that search and rescue authorities ashore, as well as shipping in the immediate vicinity of the ship in distress, will be rapidly alerted to a distress incident so they can assist in a coordinated search and rescue operation with the minimum delay. It is intended to automate and improve emergency communications in the maritime industry. The system also provides for urgency and safety communications and the promulgation of maritime safety information (MSI).

Equipment carriage requirements Table Minimum GMDSS carriage requirements

| Equipment | Sea area | Sea area | Sea area | Sea area |
|--------------------------------------|-----------|----------------|------------------|------------------|
| Range from Land Stations | A1 (20nm) | A2 (150/300nm) | A3 (Open Oceans) | A4 (polar areas) |
| VHF with DSC | X | X | X | X |
| SART (2) | X | X | X | X |
| NAVTEX receiver | A | A | A | A |
| EGC receiver | B | B | B | B |
| EPIRB | X | X | X | C |
| Survival Craft VHF portable (2 or 3) | X | X | X | X |
| MF telephony with DSC plus | | X | X | X |
| Inmarsat -B -C or Fleet 77 | | | X or | |
| MF/HF telephony with DSC and telex | | | X | X |

Notes:

- A. Required in those sea areas where the NAVTEX service is available.
- B. Required in those sea areas where the NAVTEX service is NOT available. The EGC receive facility may be included in the standard Inmarsat-C terminal.
- C. 406 MHz COSPAS-SARSAT EPIRB.

Notes: SOLAS Convention Ships

- Minimum three portable VHF Transceivers shall be provided on every passenger ship and on every cargo ship of 500 tons gross tonnage and upwards.
- Minimum two portable VHF Transceivers shall be provided on every cargo ship of 300 tons gross tonnage and upwards but less than 500 tons gross tonnage.
- Minimum two SARTs shall be provided on every passenger ship and on every cargo ship of 500 tons gross tonnage and upwards;
- Minimum one SART shall be provided on every cargo ship of 300 tons gross tonnage and upwards but less than 500 tons gross tonnage.

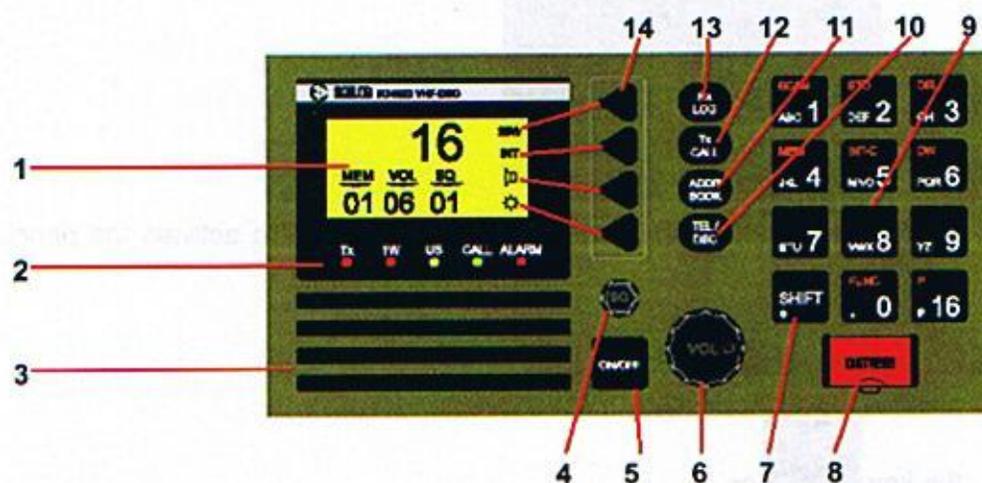
The GMDSS lays down nine principal communications functions which all ships, while at sea, need to be able to perform:

- 1) transmitting ship-to-shore distress alerts by at least two separate and independent means, each using a different radio-communication service;
- 2) receiving shore-to-ship distress alerts;
- 3) transmitting and receiving ship-to-ship distress alerts;
- 4) transmitting and receiving search and rescue coordinating communications;
- 5) transmitting and receiving on-scene communications;
- 6) transmitting and receiving signals for locating;
- 7) transmitting and receiving maritime safety information;
- 8) transmitting and receiving general radiocommunications from shore-based radio systems or networks;
- 9) transmitting and receiving bridge-to-bridge communications.

13. VHF EQUIPMENT CONTROLS;

10 VHF RADIOSTATION WITH DSC SAILOR RT4822

10.1 Controls



1. Display.
2. Indicator lamps. Condition when lit:
 Tx: Transmitting.
 1W: 1 watt transmission mode.
 US: US channel system activated.
 CALL: DSC call for you is received.
 ALARM: Alarm call received.
3. Loudspeaker.
4. Squelch control. Adjust to silent when no station is received.
5. ON/OFF push button.
6. Volume control.
7. Shift key. Press and hold for yellow functions.
8. DISTRESS button, protected by shield. To use, lift the shield and press for 3 seconds, guided by the text displayed.
9. Keyboard.
10. TEL/DSC function switch.
 In TEL mode radiotelephone parameters are shown and selected.
 In DSC mode DSC parameters are shown and selected.
11. Open the ADDR BOOK in DSC mode.
12. Tx CALL: Press to start creating a DSC call.
13. Open the Rx log of received calls in DSC mode.
14. Display keys. The function of each key is described in its respective line on the right side of the display.

In the diagram of a VHF-DSC (#14) FCC question 1-13C1: What is the purpose of the INT-USA control settings on a VHF?

Answer is (to change certain international duplex channel assignments to simplex in the U.S. for VTS and other purposes).

Many International frequencies are in Duplex and on same radios, simple push of a button you will also change transmitter power from 1 watt to 25 watt.

Duplex is used by coast stations, and simplex between ship-to-ship calls, and at 1 watt. Normally if you are in a port or harbor you must transmit at 1 watt, Open Ocean 25 watts can be used, but you need to be aware of other ships around you so you do not interfere with their communication at the 25 watt setting. In the simplex mode, this will ensure that vessels not directly participating in the communication can hear both sides of the radio exchange, example in a distress, urgency, or safety calls.

In 47CFR80.871 there is a list of frequencies that are designated for coast stations in the U.S., you can find a list of frequencies in the following Pub's 117, Coast Pilot, and 47CFR Part 80.

FCC question 1-13C3 the dual watch (DW) function is used to?

Answer is: listen on any selected channel while periodically monitoring channel 16.

In diagram # 9 Key 6 in the upper part there is DW to set this radio on dual watch, you set radio to the channel, then push button #7 shift, then push button #6, this will set your radio in dual watch mode. Channel 16 is your prime channel.

Many radios have a scan function so you can scan either all channels, or select the channels you wish to monitor.

In adjusting your squelch #4, is to minimize any background noise, but not to have it set so high that it will interfere with normal operation of your radio.

Remember you must get to know how to use YOUR RADIO. Read the operator's manual, this is a valuable source of information.

14. VHF CHANNEL SELECTION;

There are two pub's that you can review to select the correct channel for your communication need's. They are; Pub 117 and Coast Pilots

The prime channels are **16**, for general calling, and for distress, urgency, and safety.

Channel **13**, Bridge-to-Bridge

Channel **70** for DSC calling

Channel **06** for SAR ship to aircraft

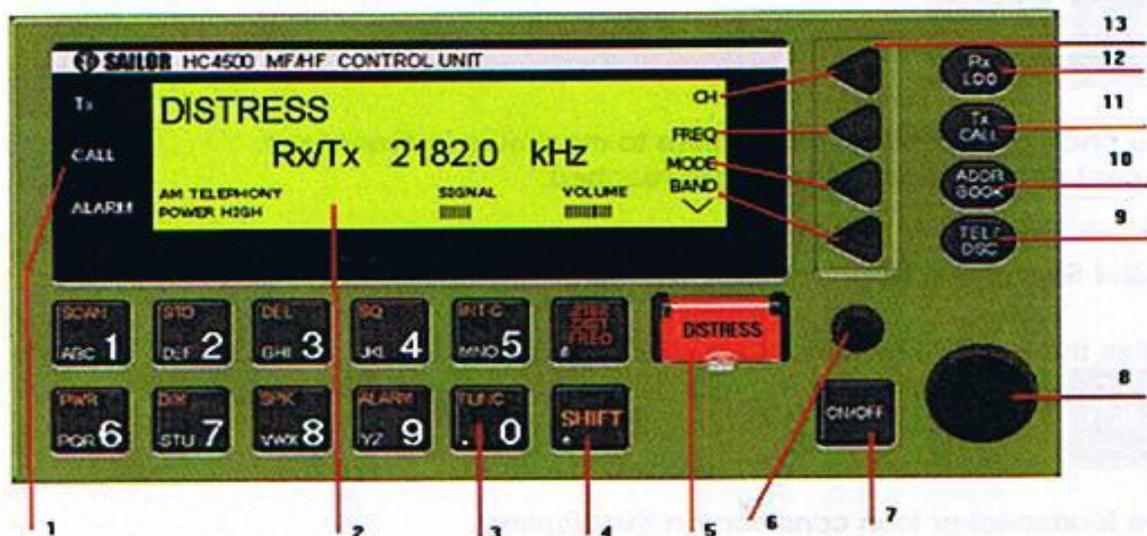
Channel **28** to place a shore side telephone call through a coast station.

SEE NOTE IN CHAP 15. ABOUT DSC IF YOU'RE RADIO HAS THAT CAPACITY

15. MF/HF EQUIPMENT CONTROLS;

11.2 Basic operation

11.2.1 Controls



1. Indicator Lamps, condition when lit
Tx; Transmitting
Call: DSC call received for you
Alarm: Received Alarm call
2. Display
3. Keyboard
4. Shift Key, press and hold for function inside upper left corner of each key.
5. DISTRESS button, Protected by shield. To use, lift the shield and press for three seconds, guided by the text in display(2).
6. Tuning control.
7. ON/OFF push button
8. Volume control.
9. TEL / DSC function switch.
In TEL mode radio telephone parameters are shown and selected.
In DSC mode DSC parameters are shown and selected.
10. Open the ADDR BOOK in DSC mode.
11. Tx CALL: Press to start creating a DSC call.
12. Open the Rx log over received calls in DSC mode.
13. Soft Keys: the function of each key is described in its respective line at the right edge of the display.

The example diagram of a MF/HF maritime radio telephone has built-in DSC (Digital Select Calling) and radiotelex (SITOR) (Simplex Telex Over Radio) systems. This includes MF and HF SSB (single side band) radiotelephone, also radiotelex that is connected to a PC and a printer. Most units are connected to a GPS unit for automatic position up-dates with UTC time that can be used in sending DSC distress messages.

An important note: To use these systems your station is required to have an MMSI number.

MMSI is maritime mobile service identities in the U.S. non-federal users i.e. commercial users or those who travel outside the U.S. and Canada, must apply for a ship station license, or an amendment to a ship station license to obtain an MMSI.

Non-commercial users e.g. recreational boaters who stay in U.S. waters can obtain an MMSI through BOAT US or SeaTow.

The FCC normally as part of the ship station license application (form 506) will assign an MMSI to that ship station license.

The MMSI consist of a 9 digit number, the first 3 are the MID maritime identification digits, each country has their own number.

For the U.S. they are 366, 367, 368, 369, and the state of Alaska is 303. The remaining 6 digits are unique to your vessel.

Coast Stations have 00-MID-XXXX

Group stations as in a Fleet of ships start with 0-MID-XXXXX

Your MMSI should be programed in your DSC radio equipment first by the installer, if the installer is yourself than you will need to study your operator's manual closing so to install it correctly or have a radio tech do it for you.

In the event of a distress situation and you send a DSC message, not only will coast station know who your are and your location (GPS input to your radio for automatic updates) but other vessels with the same capacity, will be able to assist you.

For your VHF-FM DSC unit, they monitor channel 70 continuously in the 156-162 MHz Band.

As for MF/HF DSC unit has a scanner capacity to monitor MF DSC 2187.5 kHz, HF DSC 4207.5, 6312, 8414.5, 12577, 16804.5 kHz

For your Radiotelex (SITOR) operate on the same frequencies as your MF/HF unit but the data is coded. This function is beyond this study guide intent, and will not be covered here, but the format for the coding will be covered:

In SITOR they use two approved type of data code, they are;

ARQ: automatic retransmissions request, this works **ONLY** between two stations. This is like a telephone conversation. You call, they reply.

FEC: forward error correction, this is sent out to all stations and requires no reply.

In FCC 1-15C1 Which modes could be selected to receive vessel traffic lists from high seas shore stations?

Answer: SSB and FEC, single side band is voice, FEC is SITOP, or Telex.

In FCC 1-15C2 Why must all MF-HF Distress, Urgency, and Safety communications take place solely on the 6 assigned frequencies and in the simplex operating mode?

Answer: For non-GMDSS ships, to maximize the chances for other vessels to receive those communications. For GMDSS or DSC-equipped ships, to maximize the chances for other vessels to receive those communications following the transmission of a DSC call of the correct priority.

In FCC 1-15C3 To set up the MF/HF transceiver for a voice call to a coast station, the operator must?

Answer: Select J3E mode for proper voice operations. See section 16 for emission selections

In FCC 1-15C4 MF/HF transceiver power levels should be set;

Answer: to the lowest level necessary for effective communications.

As with any radio equipment, start at low power and work your way up, if the ship is within visual distance it makes no sense to use high power. This may damage their equipment, and/or interfere with other ships communications that are not in visual sight.

In FCC 1-15C5 To set up the MF/HF transceiver for a TELEX call to a coast station, the operator must:

Answer: Select F1B mode or J2B mode depending on the equipment manufacturer. See section 16 for emission selections.

In FCC 1-15C6 What is the purpose of the Receiver Incremental Tuning (RIT) or "Clarifier" control?

Answer: It acts as a "fine-tune" control on the receive frequency.

16. MF/HF FREQUENCY & EMISSION SELECTION;

In making a call to another ship station, you would normally call on VHF channel 16 or with your MF/HF unit call on 2182 kHz, or if you know the other vessel monitors a given frequency you can call them on that frequency.

Remember that VHF channel 16 and MF SSB 2182 kHz are VOICE communication frequencies, and general calling frequencies and that you will have to shift to a working frequency after you have made contact with your called station.

In using your MF/HF unit in calling a coast station, most coast station use paired frequencies that can be found in Pub 117, or the ITU pub's.

The ITU International Telecommunication Union has a short cut of selecting paired frequencies

For communications with coast stations. ITU has developed their "ITU Channels" example if the ITU Channel is 1212, this means that it is the 12th channel in the 12 MHz band.

Most MF/HF units have these ITU channels pre-programed in them, but you can add or delete new ones in your radio, see your operator's manual.

To help explain how class of emission is set-up we will use an example out of pub 117 page VI.

Class of Emissions-----A---1---A

(1)—Type of modulation of the main carrier frequency-----

A---Means--- Double sideband

(2)---Nature of signal(s) modulated carrier

1-----Means Single channel containing quantized/digital information without modulating subcarrier, excluding time division multiplex.

(3) Type of information to be transmitted. "Information" does not include information of a constant, unvarying nature, such as provided by standard frequency emissions, continuous wave and pulse radars, etc.

A----Means Telegraphy (aural reception)

Types of Modulation with Class of Emissions and Equipment used.

AMPLITUDE MODULATION

- A1A** – Continuous wave telegraphy, Morse code
- A2A** – Telegraphy by on/off keying of tone-modulated carrier, Morse code: double sideband
- A3E** – Radiotelephony using amplitude modulation; double sideband
- A3C** – Facsimile
- A9W** – Composite emission of telegraphy and telephony; double sideband
- G1D** – Data transmission
- G3E** – Radiotelephony
- H2A** – Telegraphy by on/off keying of tone-modulated carrier
- H2B** – Selective calling using sequential single frequency code
- H3E** – Radiotelephony; single sideband, full carrier
- J3C** – Facsimile: single sideband, suppressed carrier
- J3E** – Radiotelephony using amplitude modulation: single sideband, suppress carrier
- N0N** – Unmodulated continuous wave emission
- R3E** – Radiotelephony

FREQUENCY (or PHASE) MODULATION

- F1B** – Narrow band direct printing (NBDP); Radioteletype
- F2A** – Telegraphy by on/off keying of tone-modulated carrier
- F3C** – Facsimile
- F3E** – Radiotelephony using frequency modulation

17. EQUIPMENT TESTS;**IAW 47CFR80.101 Radiotelephone testing procedures.**

This section is applicable to all stations using telephony except where otherwise specified.

(a) Station licensees must not cause harmful interference. When radiation is necessary or unavoidable, the testing procedure described below must be followed:

(1) The operator must not interfere with transmissions in progress.

(2) The testing station's call sign, followed by the word "test", must be announced on the radio-channel being used for the test.

(3) If any station responds "wait", the test must be suspended for a minimum of 30 seconds, then repeat the call sign followed by the word "test" and listen again for a response. To continue the test, the operator must use counts or phrases which do not conflict with normal operating signals, and must end with the station's call sign. Test signal must not exceed 10 ten seconds, and must not be repeated until at least one minute has elapsed. On frequency 2182 kHz or 156.800 MHz, the time between tests must be a minimum of five minutes.

(b) Testing of transmitters must be confined to single frequency channels on working frequencies. HOWEVER, 2182 kHz and 156.800 kHz may be used to contact ship and coast stations as appropriate when signal reports are necessary. Short tests on 4125 kHz are permitted by vessels equipped with MF/HF radios to evaluate the compatibility of the equipment for distress and safety purposes. U.S. Coast Guard stations may be contacted on 2182 kHz or 156.800 MHz for test purposes only when tests are being conducted by Commission employees, when FCC-licensed technicians are conducting inspections on behalf of the Commission, when qualified technicians are installing or repairing radiotelephone equipment or when qualified ship's personnel conduct an operational check requested by the U.S. Coast Guard. In these cases the test must be identified as "FCC" or "technical"

(c) Survival craft transmitter tests must not be made within actuating range of automatic alarm receivers.

Note: test cannot be done during silent periods. (for 2182 kHz 00:00-to-00:03 00:30-to-00:33) and (500kHz 00:15-to-00:18 00:45-to-00:48 no longer used but still in the question pool.)

18. EQUIPMENT FAULTS;**IAW 47CFR80.869, 931, 1023**

Unless the normal use of the required radiotelephone station demonstrates that the equipment is operating, a test communications on a required or working frequency must be made each day the ship is navigated. When this test is performed by a person other than the master and the equipment is found to be defective the master must be promptly notified.

80.931: a test communication on a required frequency in the 1605 to 27500 kHz band or the 156 to 162 MHz band must be made by a qualified operator each day the vessel is navigated. If the equipment is not in proper operating condition, the master must be promptly notified.

80.1023 The master must have it restored to effective operating condition as soon as possible.

If the radio equipment is not operating as intended, it should be secured and not used, until repaired.

47CFR80.90: Transmission must be suspended immediately upon detection of a transmitter malfunction and must remain suspended until the malfunction is corrected, except for transmission concerning the immediate safety of life or property, in which case transmission must be suspended as soon as the emergency is terminated.

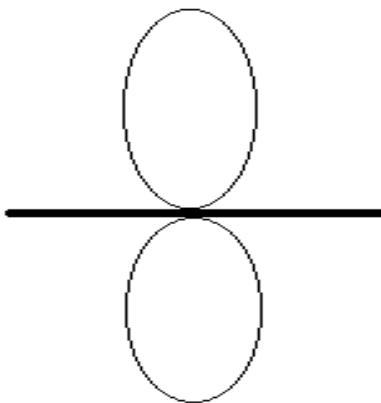
19. ANTENNAS;

An important characteristic of an antenna is a radiation pattern. A radiation pattern is a graph showing the actual intensity of a propagated radio wave at a fixed distance as a function of the antenna system.

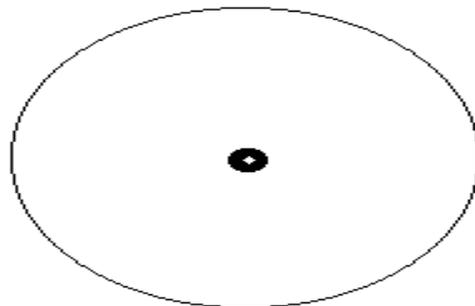
A dipole being horizontal to the surface of the earth is horizontally polarized.

Polarization refers to the angle of the transmitted electric field. If the electric field is horizontal, both transmit and receive antennas must be horizontal. Horizontal dipole has bi-directional ‘figure-of-eight’ radiation pattern. A vertical antenna being vertical to the surface of the earth is vertically polarized. This antenna has omni directional circular radiation pattern. Omni directional antennas are commonly used on the ships.

Two-dimensional radiation patterns for horizontal dipole and vertical whip antenna are given on the figure below.



Horizontal dipole



Vertical whip antenna

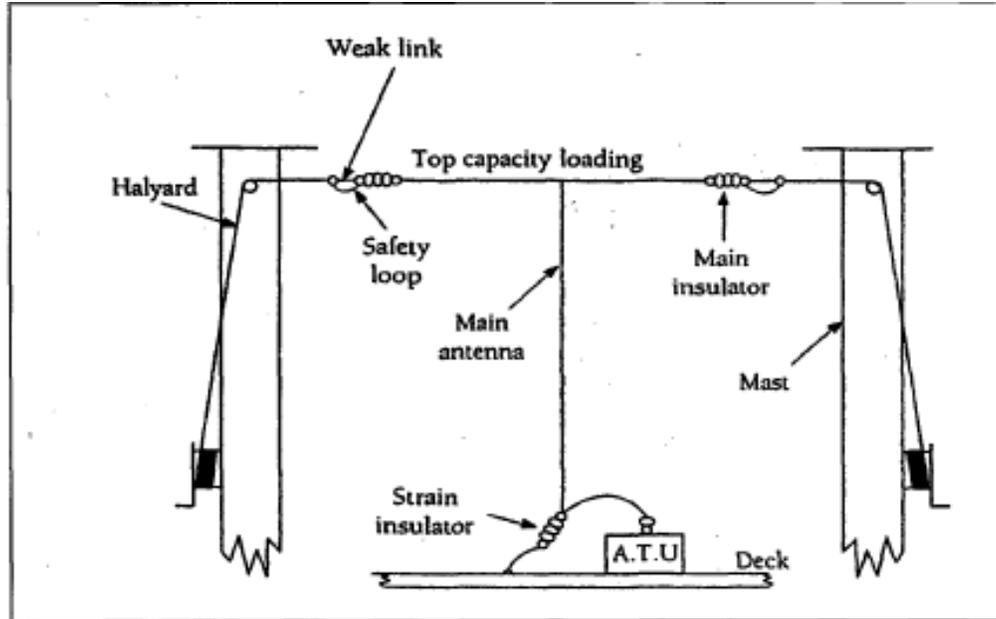
IAW 47CFR80.81 Antenna requirements for ship stations:

All telephony emissions of a ship station or a marine utility station on board ship within the frequency band 30-200MHz must be vertically polarized.

IAW 47CFR80.866 Spare antenna

A spare transmitting antenna completely assembled for immediate erection must be provided, if the installed transmitting antenna is suspended between supports, this spare antenna must be a single-wire transmitting antenna of the same length and must also include suitable insulators.

Emergency antenna may be a wire antenna. A wire antenna may be stretched between masts or between a mast and another elevated part of the ship's superstructure. An example is shown below of a **T-type** antenna, although inverted-L types may also be found.



However, because of lack of space on board many modern ships you may use vertical whip antennas for MF/HF transmissions. For example, the main HF transceiver may use an 8m whip, bypass the antenna tuner and connect to the whip antenna, 8 meter should be long enough (30ft).

An **Antenna Tuning Unit (ATU)** is usually used to "match" the transmitter output to the antenna over a wide range of frequencies. In effect, the ATU uses electrical components, i.e. coils (inductors) and capacitors, to achieve a resonant electrical length in combination with the actual physical length of the antenna. Even if the ATU can match a very short antenna to the transmitter, for example, the overall efficiency will be poor.

Connections between the transceiver, the ATU and the main antenna should be kept as short as possible to ensure the efficient transfer of energy to the antenna. The ATU uses electrical components, i.e. coils (inductors) and capacitors.

20. POWER SOURCE'S; 47CFR Subpart S Small Passenger Boats

IAW 47CFR80.901 Applicability

The provisions of Part III of Title III of the Communication Act require United States vessels which transport more than (6) six passengers for hire while such vessels are being navigated on any tidewater within the jurisdiction of the United States adjacent or contiguous to the open sea, or in the open sea to carry a radiotelephone installation complying with this subpart. The provisions of Part III do not apply to vessels which are equipped with a radio installation for compliance with Part II of Title II of the Act, or for compliance with the Safety Convention, or to vessels navigating on the Great Lakes.

It would be too technical and lengthy to quote the 47CFR Part 80 for the section therefore here is a summary.

1.) Main Power to Radio Equipment: Normally the vessels main electrical power is provided by their main propulsion systems, some vessels have electrical generators that supply the vessel with power while their main propulsion is by another means.

The main source of power must be readily available for use under normal load conditions for both radiotelephone and antenna's and other radio equipment.

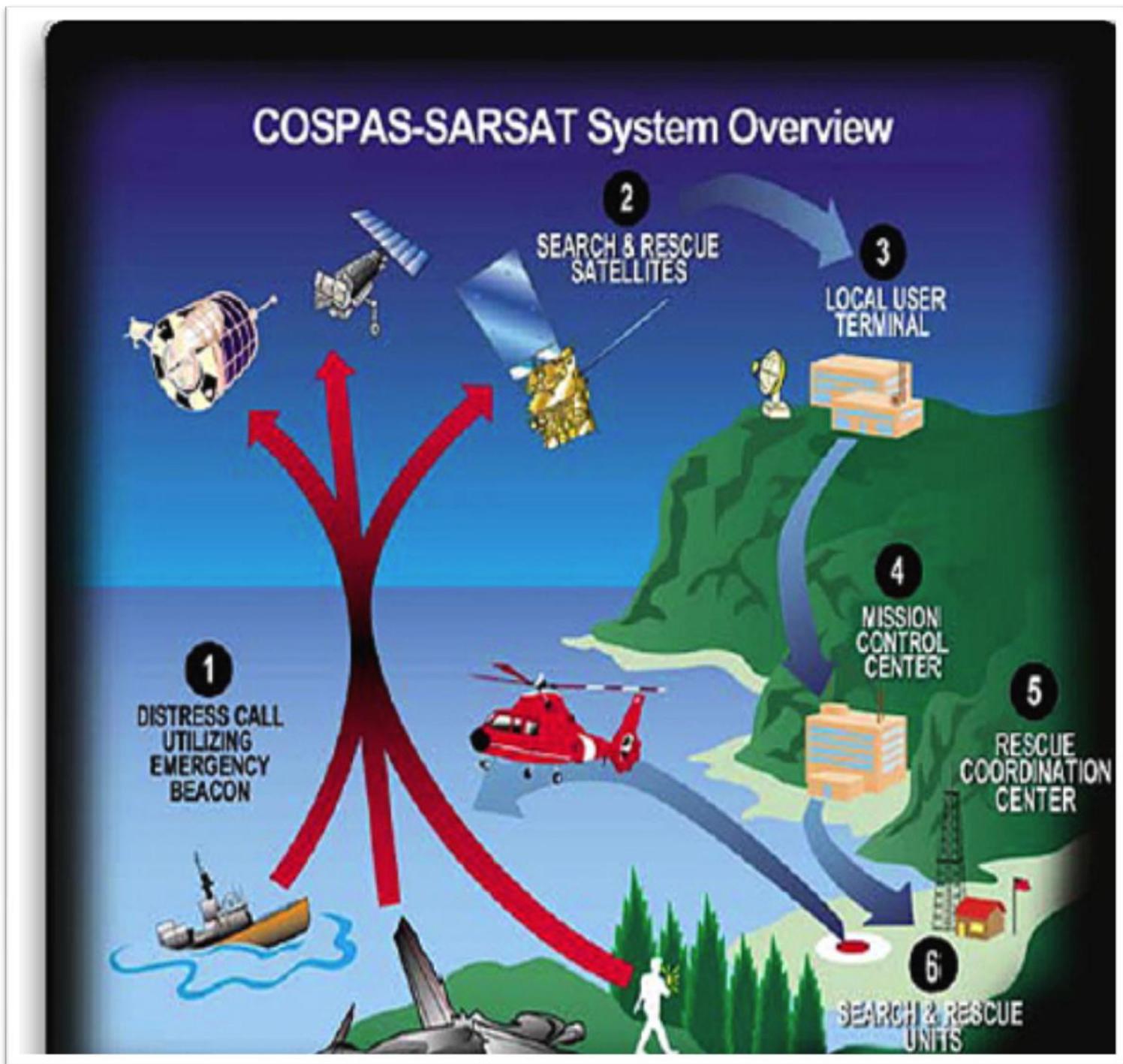
2.) Emergency power supply: this is normally a emergency generator that is able to run for 24 hours, and only power emergency equipment and lighting. Most modern vessels are equipped with these generators. Again this depends on your type of vessel and the service it is employed.

3.) Reserve power supply: The reserve power supply must be independent of the vessel's propulsion and any other electrical system. This is normally batteries in a 24volt DC system, and will have sufficient power for the equipment to run for 6 hours. Each vessel and type of service they are employed in may require different hours of operations.

It must be of sufficient energy to operate the radiotelephone and/or other radio equipment. Must be available at all times so that the radio installations conducting Distress and Safety communications in the event of ship's main or emergency sources of electrical power shuts down.

See 47CFR80.915 for more information.

21. EPIRB; (Emergency Position Indicating Radio Beacon) See 47CFR80.1051 for more information



General information

According to 1988 SOLAS Amendments (Chapter IV, Part C, Regulation 7) every ship covered by the SOLAS convention shall be provided with an Emergency Position Indicating Radio Beacon (EPIRB). EPIRBs are mandatory from August 1, 1993.

COSPAS-SARSAT Phase-Out of 121.5/243 MHz Alerting Services

Switch to 406!

The International COSPAS-SARSAT System has ceased satellite processing of 121.5/243 MHz beacons on **1 February 2009**. All beacon owners and users should replace their 121.5/243 MHz beacons with 406 MHz beacons as soon as possible.

Only 406 MHz beacons are now detected by the COSPAS-SARSAT satellite system. This affects all maritime beacons (EPIRBs), all aviation beacons (ELTs) and all personal beacons (PLBs). However, other devices (such as man overboard systems and homing transmitters) that operate at 121.5 MHz and do not rely on satellite detection are not affected by the phase-out of satellite processing at 121.5 MHz.

The decision to terminate 121.5/243 MHz processing was made in October 2000 at the 25th Session of the COSPAS-SARSAT Council (CSC-25).

Why Switch?

COSPAS-SARSAT made the decision to cease satellite processing at 121.5/243 MHz in response to guidance from the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO). These United Nations organizations mandate safety requirements for aircraft and maritime vessels and have recognized the limitations of the 121.5/243 MHz beacons and the superior capabilities of the 406 MHz alerting system.

The digital 406 MHz beacons offer many advantages over analog 121.5/243 MHz beacons. With a 406 MHz beacon, the position of the distress can be relayed to rescue services more quickly, more reliably and with greater accuracy.

Types of beacons

At present there are three types of beacons in use:

- Emergency Position Indicating Radiobeacon (EPIRB) used by ships;
- Emergency Locator Transmitters (ELT) used by aircraft;
- Personal Locator Beacons (PLB) used in various land operations

COSPAS -SARSAT Functions

COSPAS-SARSAT (COSPAS: Space System for Search of Distress Vessels; SARSAT:

Search and Rescue Satellite-Aided Tracking) is a joint international satellite-aided search and rescue system, established by organizations in Canada, France, Russia and USA.

As of January 2000, the COSPAS-SARSAT system was composed of seven satellites in near polar orbits, at approximate heights of 850 km for SARSAT and 1,000 km for COSPAS, 35 ground receiving stations (LUTs) and 20 Mission Control Centres (MCCs) operated by 22 countries.

These satellites monitor the earth's surface continuously searching for emergency radio beacon signals. Each satellite makes a complete orbit of the earth around the poles in about 100 minutes, travelling at a velocity of 7 km per second. The satellite views a 'swath' of the earth over 4000 km wide, as it circles the globe. When viewed from the earth, the satellite crosses the sky in about 15 minutes, depending on the maximum elevation angle of the particular pass. Diagrammatic representation of orbits of the satellites is shown on Figure above.

EPIRB Emergency Position Indicating Radio Beacons

When activated the beacon transmits signals which are detected by COSPAS-SARSAT polar orbiting satellites equipped with suitable receivers. The signals are then relayed to a ground receiving station known as a Local User Terminal (LUT) which processes the signals to determine the beacon's position and identity. Doppler shift (using the relative motion between the satellite and the beacon) is used to locate the beacons. An alert is then relayed together with position data via a Mission Control Centre (MCC) to either a national Rescue Coordinating Centre (RCC), another MCC or to the appropriate search and rescue authority so that search and rescue (SAR) activities can be initiated.

The Doppler location provides two positions for each beacon: the true position and its mirror image relative to the satellite ground track. This ambiguity is resolved by calculations that take into account the earth's rotation. With appropriate frequency stability, as specified for 406 MHz beacons, the true solution may be determined in a single satellite pass. In the case of 121.5 MHz beacons, normally, a second pass is required to resolve the ambiguity. The accuracy of location of EPIRBs by measurement of Doppler effect is typically better than 5 km for 406 MHz and 20 km for 121.5 MHz. The improved performance of 406 MHz satellite EPIRBs is the reason these beacons were selected for the GMDSS. The 406 MHz EPIRBs should be provided with a 121.5 MHz beacon primarily for homing by aircraft.

Modes of operation

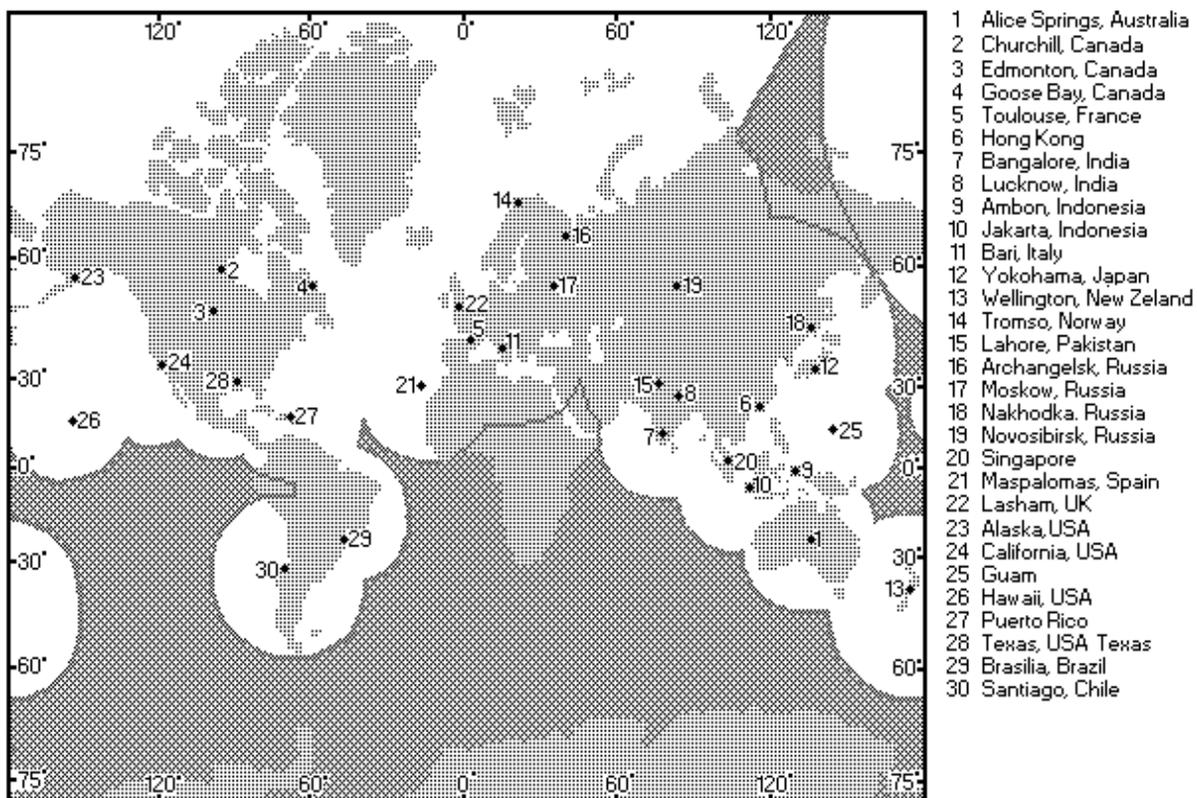
The COSPAS-SARSAT system uses two modes for detection and location of beacons:

- the realtime mode;
- the global coverage mode.

1. Realtime 406 MHz mode: When the satellite receives the 406 MHz beacon signals, the Doppler shift is measured and the digital data is recovered from the beacon signal. This information is retransmitted to any LUT in view in real time; this data is also stored for later transmission to earth by satellite.

2. Global 406 MHz mode: Only the 406 MHz beacon provides full global coverage. This is because the data received from the beacon is stored in the satellite and relayed to the LUT when satellite to LUT visibility can be achieved. The mean notification time (the period from activation of an EPIRB to reception of a valid alert message by the appropriate RCC) in this mode of operation is currently about one and a half hours, but may be reduced if more satellites are employed.

Figure 1b - Satellite Visibility Area of Existing COSPAS - SARTSAT LOCAL USER TERMINALS (LUTs)



Identification code

EPIRB sends a 0.5 second burst of radio frequency energy every 50 seconds which contains digitally coded information including identity of the ship and country of origin of the ship in distress. Until 1 February 1999, the identification code should include 3 digit MID (Maritime Identification digits) followed by either:

- the trailing 6 digits of the ship station identity in accordance with Appendix 43 of ITU Radio Regulations; or
- a unique serial number; or
- a radio call sign.

After 1 February 1999, all new beacon installations should have the identity in accordance with Appendix 43 of ITU Radio Regulations.

Performance standards

Performance standards for float-free satellite EPIRBs operating on 406 MHz are given in the relevant IMO Resolution pertaining to the COSPAS-SARSAT EPIRBs. The EPIRB should be of an automatic float-free type. The battery should have sufficient capacity to operate the EPIRB for a period of at least 48 hours. The EPIRB should:

- be so designed that the electrical portions are watertight at a depth of 10 m for at least 5 minutes;
- be automatically activated after floating free;
- be capable of manual activation and manual deactivation;
- be provided with means to indicate that signals are being emitted;
- be capable of being dropped into the water without damage from a height of 20 m;
- be capable of being tested without using the satellite system;
- be provided with a 121.5 MHz beacon primarily for homing by aircraft;
- be of highly visible yellow/orange colour.

New developments in COSPAS-SARSAT system

Following a two-year demonstration and evaluation, the COSPAS-SARSAT Council decided in October 1998 to adopt 406 MHz geostationary satellite components (GEOSAR) as a complement to the low-altitude, polar-orbiting system (the COSPAS-SARSAT LEOSAR system).

The 406 MHz GEOSAR system is composed of geostationary Earth-orbiting satellites and their associated ground processing facilities, that have the capability to detect transmissions from COSPAS-SARSAT type approved 406 MHz distress beacons.

Demonstration and evaluation results had confirmed the expected benefits of the GEOSAR satellite system. Except for the polar regions over 75 degrees latitude, the 406 MHz GEOSAR system provides a continuous coverage which allows quasi real-time alerting. However, it cannot support the Doppler location technique. At the end of 1999 eight models of beacons with the capability to accept position data from internal or external navigation devices, essentially GPS receivers, had received a COSPAS-SARSAT type approval certificate.

As of January 2000, the GEOSAR ground segment included 6 receiving stations (GEOLUTs). Although not yet formally commissioned to the COSPAS-SARSAT standard, these GEOLUTs are routinely providing distress alerts which are forwarded to the appropriate SAR services. The United States notified ICAO of the addition of the 406 MHz capability on the Geostationary Environmental Operational Satellites (GOES-East and GOES-West) to the United States contribution to the COSPAS-SARSAT Programme. In addition to the satellites used during the GEOSAR Demonstration and Evaluation (GOES-East, GOES-West and INSAT-2), geostationary satellites from Russia in the LUCH series, and the Meteosat Second Generation satellites from EUMETSAT, planned for launch from 2000, will also be carrying 406 MHz repeaters, thus providing in the near future additional redundancy to the geostationary coverage at 406 MHz.

LEOSAR FOOT PRINT



Registration, Care, Use and Disposal

Masters must ensure that their EPIRBs have been registered with the relevant authority in the flag State, enabling details to be available to SAR authorities when requested.

EPIRBs should be installed so that they cannot be tampered with or accidentally activated. EPIRBs are equipped with a buoyant lanyard suitable for use as a tether in order to secure the beacon to a liferaft, boat or person in the water.

To prevent the EPIRB from being dragged under water, the lanyard should never be attached to the ship, or arranged in such a way that it can be trapped in the ship's structure when floating free.

The EPIRB should not be activated if SAR units are already on-scene. If previously activated, it should be switched off when rescue units arrive.

Damaged EPIRBs or those on a ship going for scrap should be made inoperable. Remove the battery before demolition or before returning it to the manufacturer for re-programming. On vessels being sold to new owners, the EPIRB must be re-registered.

To register your new EPIRB see www.sarsat.noaa.gov/beacon.html or 1-888-212-7283 or

SARSAT Beacon Registration

E/SP3, Room 3320,FB-4

NOAA

5200 Auth Road

Suitland, MD 20746-4304

EPIRB Test Procedures EPIRBs should be tested on a regular basis as follows:

Press and release test button

- Red lamp should flash once.
- Within 30 seconds the strobe and red lamp should flash several times.
- After 60 seconds the EPIRB switches off.

EPIRBs incorporate the means to carry out regular tests (without access to the space segment) and indicate the emission of a Distress alert or any fault in the equipment.

False Alerts

If an EPIRB is accidentally activated, the nearest coast station or an appropriate coast earth station or RCC MUST be informed immediately that a false Distress alert has been transmitted and should be cancelled. Details of RCCs are to be found in the ITU List of Coast Stations and various publications produced by national Administrations and service providers.

22. SART; (Search And Rescue Radar Transponder) See 47CFR80.1095 for more information**Search and Rescue Radar Transponders - SARTs**

Search and rescue transponders (SART) are used for locating ships in distress or their survival crafts. Their carriage on board ships is mandatory (Regulations III/6.22 and IV/7.1.3. of the 1988 SOLAS amendments). SART is a portable device which should be taken into the lifeboat or liferaft when abandoning ship. SART operates in the 9 GHz frequency band. When switched on it will transmit signals only when triggered by signals from an external marine or aircraft radar operating in the 9 GHz (3 cm) band. The SART signals are displayed as a line of 12 blips on a radar screen outward from the SART's position along its line of bearing. As the search craft approaches to within about 1 nautical mile of the SART the 12 dots will change to wide arcs, then into complete circles as the SART is closed. This unique radar signal is easily recognized on the radar screen and the rescue vessel can detect the survivors even in the poor visibility or at night. The SART provides a visual or audible indication of its correct operation and will also inform survivors when it is interrogated by a radar.

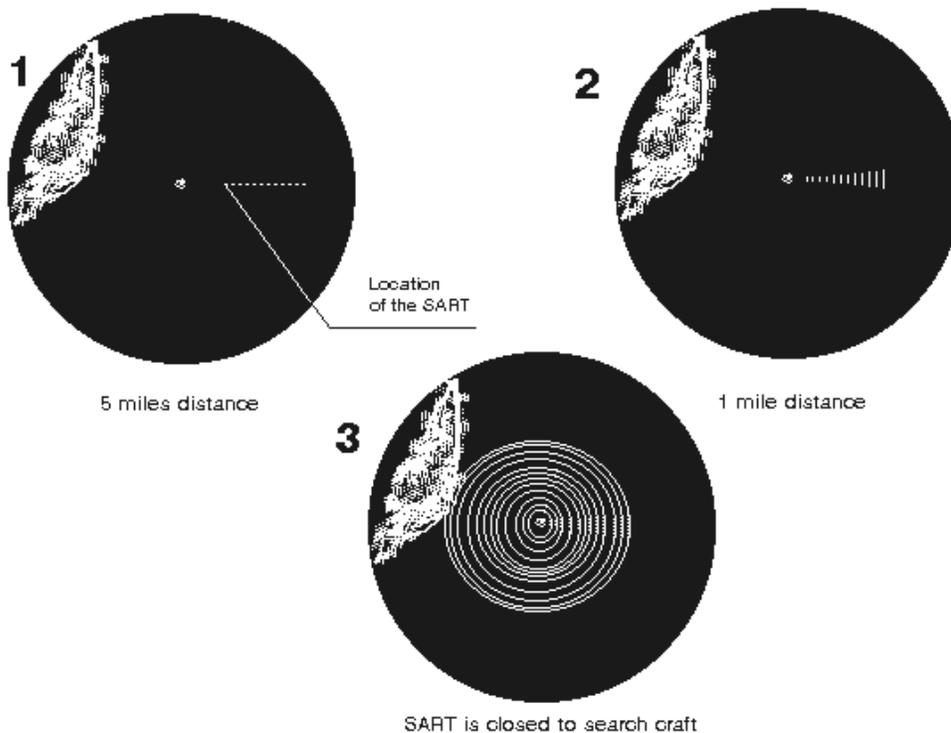
This equipment are used to home SAR units to the position of a person in Distress. They operate on the 9 GHz band and only transmit, assuming they are switched on, when interrogated by another radar. The SART should operate correctly when triggered by another vessel's radar at distances of up to at least 5 nautical miles. Detection at longer ranges will be achieved from aircraft; at 3000 ft. for example, the aircraft radar should elicit a useful response up to 30 nautical miles away from the SART.

The transmission produces a distinctive line on the radar display of about 12 blips extending out from the location of the SART along the line of bearing. These change to concentric circles when the SAR unit reaches to within about 1 mile of the SART.

To ensure that the SART transmission will be receivable over a useful distance it is essential that the SART be mounted as high as possible. The ineffectiveness of poorly mounted SARTs in survival craft and liferafts has been demonstrated repeatedly in exercises. In order to maximize the range, the regulations require a mounting height of at least 1 meter above sea level.

The SART point on the radar display may be more easily identified, especially if clutter or many other targets are present, by detuning the SAR unit's radar. Detuning reduces the intensity of return echoes on the display but allows the SART signal to be seen more easily since the SART emits a broad-band signal which detuning does not affect to the same degree.

The SART should operate correctly when interrogated at a distance of up to at least 5 nautical miles by a radar with an antenna height of 15 metres. The height of the installed SART antenna should be at least 1 m above sea level.



The SART should have sufficient battery capacity to operate in the stand-by condition for 96 hours and, in addition, following the stand-by period, to provide transponder transmissions for 8 hours when being continuously interrogated with a pulse repetition frequency of 1 kHz.

According to IMO Resolution A.802(19) SART should:

- be fitted with means to prevent inadvertent activation;
- be capable of manual activation and deactivation;
- be capable of withstanding without damage drops from a height of 20 m into water;
- be watertight at a depth of 10 m for at least 5 minutes;
- not be unduly affected by seawater or oil;
- be resistant to deterioration in prolonged exposure to sunlight;
- be capable of floating if it is not an integral part of the survival craft;
- be equipped with buoyant lanyard, suitable for use as a tether, if it is capable
- of floating;

- be of a highly visible yellow/orange colour on all surfaces where this will assist detection.

Technical characteristics of the SART should be in accordance with ITU-R Recommendation M.628-2.

Detuning the radar can be dangerous, and may infringe collision- avoidance regulations in some locations, because echoes from real targets will be removed.

SART Test Procedure

SARTs should be tested on a regular basis as follows:

- Switch SART to test mode
- Hold SART in view of radar antenna
- Check that visual indicator light operates
- Check that audible beeper operates
- Observe radar display
- concentric circles should be displayed
- Check battery expiry date

AIS SARTS Now Approved for Use in the US

The US Federal Communications Commission (FCC) of Washington this week approved the SafeLink R10 [AIS SART](#) for use in the United States.

Commenting on the approval, Global Sales Director of Orolia Ltd, Ross Wilkinson said, "With this FCC certification the United States joins a growing list of countries that have granted type approval for the SafeLink R10 SRS."



Unlike traditional RADAR SARTS, which are often large and heavy, AIS versions are intended to be attached to a lifejacket and activated by individuals in difficulty at sea. They use both GPS and AIS (Automatic Identification System) technology to send structured alert messages containing precise location information to nearby AIS equipment vessels within a radius of about 4 nautical miles. In a man overboard situation, chances of finding and recovering the casualty can be greatly increased, thanks to information given these units which can display precise bearing and distance to the man in the water in real time.

The device has the ability to quickly notify the MOB's own vessel of the loss which is important because, in the open ocean, a quick response from the crewmember's own vessel may be his only chance of rescue. In addition to basic AIS notification the SafeLink R10 SRS specifically has been designed by UK-based Kannad Marine to be waterproof (up to 5 metres), compact and ruggedly constructed.

Worn on a lifejacket and activated by simply sliding off the safety tab and lifting an arming cap to deploy the antenna, this unique product sends structured alert messages, GPS position and a special identity code directly to AIS receivers within (approximately) a four mile radius. The accuracy of data is guaranteed thanks to the unique inbuilt high precision GPS receiver which updates every 60 seconds. With precise location, bearing and range data given, fellow crew members or nearby sailors' AIS enabled receivers have all the information they need to locate the position of the person in difficulty and effect a speedy recovery, greatly increasing chances of rescue.

The R10 SRS can also be professionally fitted to a lifejacket so that it automatically activates whenever the lifejacket is inflated. A flashing LED light aids location at night. The R10 SRS is guaranteed to transmit continuously for 24 hours and has a seven year battery storage life.

23. SURVIVAL CRAFT VHF; See 47CFR80.1095

Portable two-way VHF radiotelephone

According to the Chapter III of the 1988 SOLAS Amendments the following survival craft radio equipment shall be provided on the board of every GMDSS fitted ship:

- Portable two-way VHF radiotelephone.
- Radar transponder.

According to GMDSS requirements (Chapter III, 1988 SOLAS amendments) every passenger ship and every cargo ship over 500 tons gross tonnage must have at least three two-way VHF radiotelephone apparatus. At least two two-way VHF radiotelephone apparatus shall be provided on every cargo ship of 300 tons gross tonnage and upwards but less than 500 tons gross tonnage. Such apparatus shall conform to 'Performance standards for survival craft two-way VHF radiotelephone apparatus' adopted by IMO. These requirements are in use from 1 February 1995. Two-way VHF radiotelephone apparatus provided on board ships prior to 1 February 1992 and not complying fully with the performance standards adopted by the IMO may be accepted by the Administration until 1 February 1999 provided the Administration is satisfied that they are compatible with approved two-way VHF radiotelephone apparatus.

The equipment should be portable and capable of being used for on-scene communication between survival craft, between survival craft and ship and between survival craft and rescue unit. It may also be used for on-board communication. The equipment should comprise at least:

- an integral transmitter/receiver including antenna and battery;
- an integral control unit including a press-to-transmit switch;
- an internal microphone and loudspeaker.

The equipment should:

- be capable of being operated by personnel wearing gloves;
- withstand drops on to a hard surface from a height of 1 m;
- be watertight to a depth of 1 m for at least 5 minutes;
- be either of a highly visible yellow/orange colour or marked with a surrounding yellow/orange marking strip;
- not be unduly affected by seawater or oil.

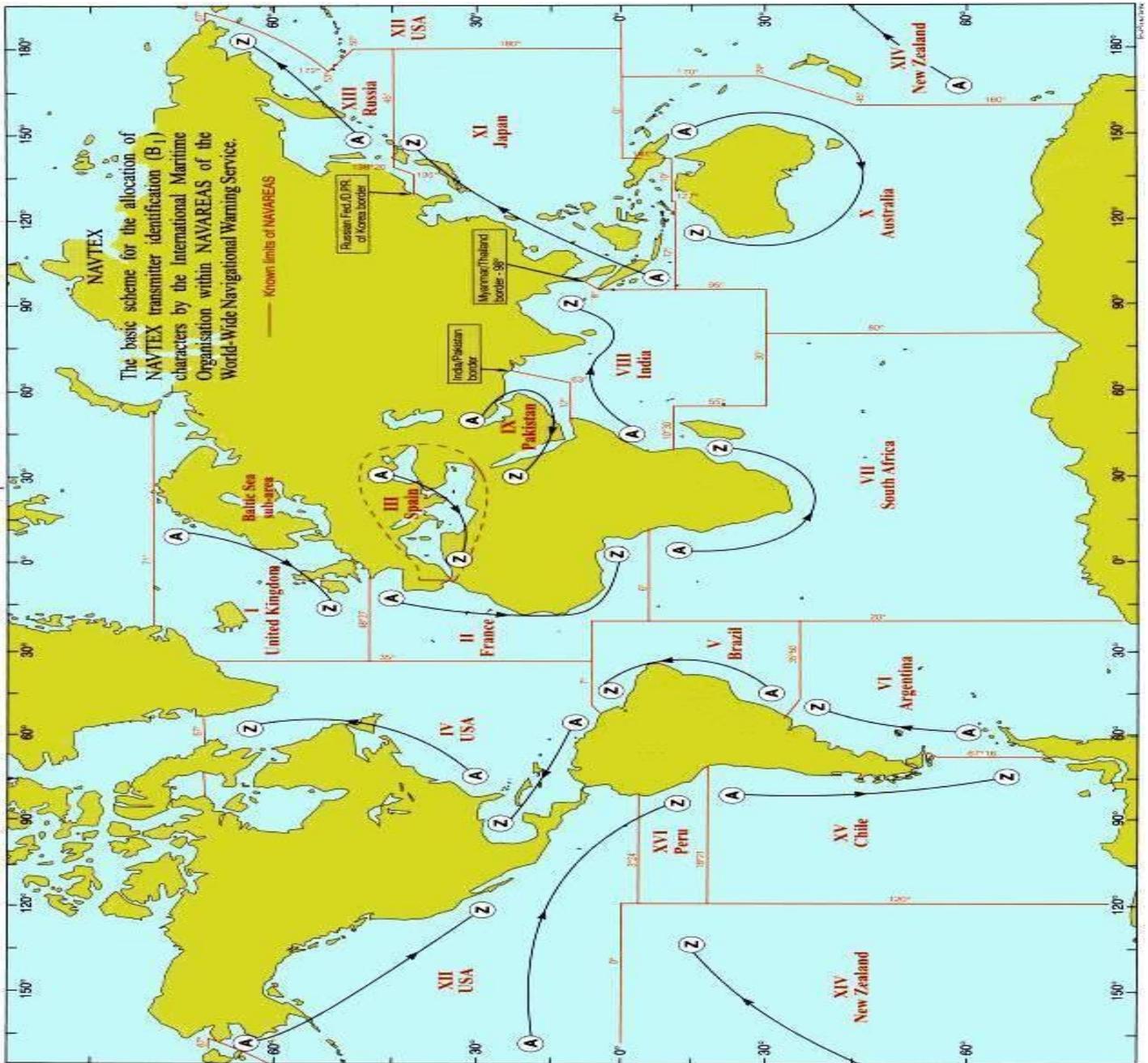
The two-way radiotelephone should be capable of operation on the frequency 156.8 MHz (VHF channel 16) and on at least one additional channel. All channels fitted should be for single-frequency voice communication only. The G3E class of emission must be used.

The effective radiated power should be a minimum of 0.25 W. Where the effective radiated power exceeds 1 W, a power reduction switch to reduce the power to 1 W or less is required.

Survival craft two-way radiotelephone apparatus installed before 23 November 1996 may be equipped with a primary or secondary battery integrated in the equipment. Where secondary batteries are used, suitable arrangements should be made for the availability of fully charged cells in the event of a distress situation. Note we will discuss more on batteries in chapter 20.

The primary battery should have sufficient capacity to ensure 8 hours operation at its highest rated power with a duty cycle of 1:9. This duty cycle is defined as 6-second transmission, 6-second reception above squelch opening level and 48-second reception below squelch opening level. Primary batteries should have a shelf life of at least two years, and if identified to be user-replaceable should be of a highly visible yellow/orange colour.

24. NAVTEX: 47CFR80.1085 FOR MORE INFORMATION



General information

International NAVTEX (NAVigational TeIEX) service means the co-ordinated broadcast and automatic reception on the frequency 518 kHz of maritime safety information (MSI) by means of narrow-band direct-printing telegraphy. NAVTEX is one of the elements of the GMDSS system.

The operational and technical characteristics of the NAVTEX system are contained in Recommendation ITU-R M.540. Performance standards for shipborne narrow-band direct-printing equipment are laid down in IMO Assembly resolution A.525(13), and in PUB 117 Chap 3 review this pub.

The principal features are as follows:

- The service uses a single frequency (518 kHz) on which coast stations transmit information in English on a time-sharing basis to prevent mutual interference. All necessary information is contained in each transmission.(some units can operate on 490kHz and 4209.5kHz and is used for local languages)
- The power of each coast station transmitter is regulated so as to avoid the possibility of interference between coast stations. NAVTEX transmissions provide a range of about 250 to 400 nautical miles.
- Dedicated NAVTEX receivers are used on the board of the ships. They have the ability to select messages to be printed, according to a technical code (B1B2B3B4) which appears in the preamble of each message.

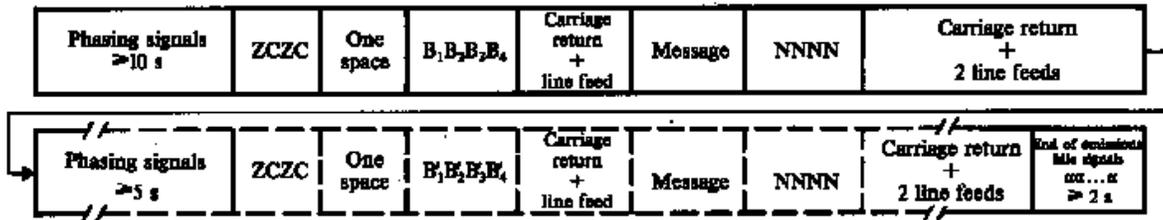
NAVTEX message format

The standard format of Navtex message includes:

ZCZC—start of message group
B1, B2, B3, B4—technical code
(TIME OF ORIGIN) <-- (optional)
SERIES IDENTITY +
CONSECUTIVE NUMBER
MESSAGE TEXT
NNNN –(end of message group)

An example of Navtex message:

ZCZC JB72
040600 UTC MAR
CANCEL GALE WARNING 185
NNNN



D01-sc

The technical code parts: From message above.

B1 (J) character identify Navtex station accepted by the receiver that you have programmed in.

B2 (B) character identify the subject, see chart below.

B3,B4 (72)characters form the consecutive number of the message from that station. Each message within a subject group is allocated a serial number, between 01 and 99. This number will not necessarily relate to series numbering in other radio navigational warning systems. On reaching 99, numbering will re-commence at 01 but avoiding the use of message numbers still in force. This number is stored in the memory and is used for avoiding print-outs of the same message as before satisfactorily received. The number 00 is only used for messages of singular importance such as an initial distress message. A message carrying number 00 will always be printed.

The following (B2) subject indicator characters (types of messages) are in use:

| TYPE (B2) | SUBJECT |
|------------|-----------------------------------------------|
| A | Navigational warnings |
| B | Meteorological warnings |
| C | Ice reports |
| D | Search and rescue information |
| E | Meteorological forecasts |
| F | Pilot service messages |
| G | DECCA messages |
| H | LORAN messages |
| I | OMEGA messages |
| J | SATNAV messages |
| K | Other electronic Navaid messages |
| L | Navigational warnings - additional to "A" |
| V, W, X, Y | Special services - allocation by NAVTEX Panel |
| Z | No messages on hand |

Note: The messages type A, B, D and L cannot be rejected by the receiver.

B1 characters in line with the general global scheme given in Figure on next page which shows the IMO-adopted strategy for allocating B1 characters by alphabetical sequence through each NAVAREA of the World-Wide Navigational Warning Service.(A thru Z).

NAVTEX coast stations

List of NAVTEX coast stations is contained in the ITU List of Radiodetermination and Special Service Stations and in the IMO Master Plan of shore-based facilities for the Global Maritime Distress and Safety

System (GMDSS Master Plan) and PUB 117 Chap 3.

Most equipment have these coast stations pre-programmed in them, also NAVTEX units have the ability to program and/or delete coast stations as needed.

NAVTEX Equipment

NAVTEX broadcasts are telex transmissions using FEC mode and are normally received by a dedicated receiver which contains a printer and/or display and microprocessor and provides the following functions:

- (a) Receive only from selected stations.
- (b) Receive only certain types of messages (some cannot be rejected).
- (c) Prevent the reception of the same message again.
- (d) Store received information.
- (e) Prevent printing if signal is not good enough.

DEFINITIONS

ASSOCIATED SHIP UNIT. A portable VHF transmitter for use in the vicinity of the ship station with which it is associated.

AUTOMATED MARITIME TELECOMMUNICATIONS SYSTEM (AMTS). An automatic, integrated and interconnected maritime communications system serving ship stations on specified inland and coastal waters of the United States and presently in use on the Mississippi River and Gulf Intracoastal Waterway.

AUTOMATED MUTUAL-ASSISTANCE VESSEL RESCUE SYSTEM (AMVER). An international system, operated by the U.S. Coast Guard, which develops and coordinates search and rescue (SAR) efforts. Data is made available to recognized SAR agencies or vessels of any nation for reasons related to marine safety.

BRIDGE-TO-BRIDGE STATION. A VHF-FM radio station located on a ship's navigational bridge or main control station that operates on a specified frequency* in the 156-162 MHz band which is used only for navigational communications.

CARGO SHIP SAFETY RADIOTELEPHONY CERTIFICATE. A certificate issued after inspection of a cargo ship radiotelephone station which complies with the applicable Safety Convention (i.e. SOLAS) radio requirements.

CATEGORIES OF SHIPS.

Passenger Ship. When referenced in Part 11 of Title III of the Communications Act or the radio provisions of the Safety Convention, a ship is a 'passenger ship' if it carries or is licensed or certificated to carry more than twelve passengers.

A '**Cargo Ship**' is any ship that is not a passenger ship.

A '**Commercial Transport Vessel**' is any ship which is used primarily in commerce for transporting persons or goods to or from any harbor(s) or port(s) or between places within a harbor or port area, or in connection with the construction, change in construction, servicing, maintenance, repair, loading, unloading, movement, piloting, or salvaging of any other ship or vessel.

'**Passenger Carrying Vessel**', when used in reference to Part III of Title III of the Communications Act and of the Great Lakes Radio Agreement, means any ship transporting more than six passengers for hire.

A '**Power-Driven Vessel**' is any ship propelled by machinery.

A '**Towing Vessel**' is any commercial ship engaged in towing another ship astern, alongside or by pushing ahead. A '**Compulsory Ship**' is any ship which is required to be equipped with radiotelecommunication equipment in order to comply with the radio or radio-navigation provisions of a treaty or statute to which the vessel is subject.

A **Voluntary Ship** is any ship which is not required by treaty or statute to be equipped with radiotelecommunication equipment.

COAST STATION. A land station in the maritime mobile service.

COMMERCIAL COMMUNICATIONS. Communications between coast stations and ship stations aboard commercial transport vessels, or between ship stations aboard commercial transport vessels, which relate directly to the purposes for which the ship is used including the piloting or movement of vessels, obtaining vessel supplies, and scheduling of repairs.

DIGITAL SELECTIVE CALLING (DSC). A synchronous system used to establish contact with a station or group of stations automatically by means of radio.

DISTRESS SIGNAL An internationally recognized radiotelephone transmission indicating that a ship, aircraft, or other vehicle is threatened by grave and imminent danger and requests immediate assistance.

In radiotelephony, the internationally-recognized distress signal consists of the spoken word 'Mayday', pronounced as the French expression "m'aider".

DISTRESS TRAFFIC. All messages relative to the immediate assistance required by a ship, aircraft, or other vehicle in distress.

EMERGENCY POSITION INDICATING RADIOBEACON STATION (EPIRB). A station in the maritime mobile service whose emissions are intended to facilitate search and rescue operations.

ENVIRONMENTAL COMMUNICATIONS. Broadcasts of information about the environmental conditions in which vessels operate, i.e., weather, sea conditions, time signals adequate for practical navigation, notices to mariners, and hazards to navigation.

MARINE UTILITY STATION. A station in the maritime mobile service consisting of one or more handheld radiotelephone units licensed under a single authorization. Each unit can be operated while being hand-carried. The station operates under the rules that apply to ship stations when the unit is aboard a vessel, and under the rules applicable to private coast stations when the unit is on land.

MARITIME MOBILE SERVICE. A mobile service between coast stations and ship stations, or between ship stations, or between associated on-board communication stations. Survival craft stations and EPIRB stations also participate in this service.

MARITIME RADIODETERMINATION SERVICE. A maritime radiocommunication service for determining the position, velocity, and/or other characteristics of an object, or the obtaining of information relating to these parameters, by the propagation properties of radio waves.

NAVIGATIONAL COMMUNICATIONS. Safety communications pertaining to the maneuvering of vessels or the directing of vessel movements. Such communications are primarily for the exchange of information between ship stations and secondarily between ship stations and coast stations.

ON-BOARD COMMUNICATION STATION. A low-powered mobile station in the maritime mobile service intended for use for internal communications on board a ship, or between a ship and its lifeboats and liferafts during lifeboat drills or operations, or for communication within a group of vessels being towed or pushed, as well as for line handling and mooring instructions.

PORT OPERATIONS COMMUNICATIONS. Communications in or near a port, in locks or in waterways between coast stations and ship stations or between ship stations, which relate to the operational handling, movement and safety of ships and, in an emergency, to the safety of persons.

PORTABLE SHIP STATION. A ship station which includes a single transmitter intended for use upon two or more ships.

PRIVATE COAST STATION. A coast station, not open for public correspondence, which serves the operational, maritime-control and business needs of ships.

PUBLIC COAST STATION. A coast station that offers radio communication common carrier services to ship radio stations.

PUBLIC CORRESPONDENCE. Any telecommunication which offices and stations must, by reason of their being at the disposal of the public, accept for transmission.

RADAR BEACON ('RACON'). A receiver-transmitter which, when triggered by a radar pulse, automatically returns a distinctive signal which can appear on the display (PPI) of the triggering radar and provide range, bearing and identification information.

SAFETY SIGNAL The international radiotelephone signal *which indicates* that the station sending this signal is preparing to transmit a message concerning the safety of navigation or giving important meteorological warnings. In radiotelephony, the international safety signal consists of three oral repetitions of the word 'Security', pronounced as the French word 'Securite' sent before the call.

SAFETY COMMUNICATION. The transmission or reception of distress, alarm, urgency, or safety signals, or any communication preceded by one of these signals, or any form of radiocommunication which, if delayed in transmission or reception, may adversely affect the safety of life or property.

SELECTIVE CALLING. A means of calling in which signals are transmitted in accordance with a prearranged code to operate a particular automatic attention device at the station whose attention is sought.

SHIP OR VESSEL 'Ship' or 'vessel' includes every description of watercraft or other artificial contrivance, except aircraft, capable of being used as a means of transportation on water whether or not it is actually afloat.

SHIP RADIO STATION LICENSE. An 'authorization' issued by the FCC to operate a radio station on a vessel.

STATION. One or more transmitters or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on radiocommunication services.

SHIP STATION. A mobile station in the maritime mobile service located on-board a vessel which is not permanently moored, other than a survival craft station.

SURVIVAL CRAFT STATION. A mobile station in the maritime or aeronautical mobile service intended solely for survival purposes and located on any lifeboat, liferaft or other survival equipment.

URGENCY SIGNAL The international radiotelephone signal which indicates that the calling station has a very urgent message to transmit concerning the safety of a ship, aircraft or other vehicle, or of some person on board or within sight.

In radiotelephony, the international urgency signal consists of three oral repetitions of the word 'Pan' pronounced as the French word 'PANNE' and sent before the call.

VESSEL TRAFFIC SERVICE (VTS). A U.S. Coast Guard traffic control service for ships in designated water areas to prevent collisions, groundings and environmental harm.

WATCH. The act of listening on a designated frequency.

FCC Commercial Element 1 Question Pool (approved 25 June 2009)

Subelement A – Rules & Regulations: 6 Key Topics, 6 Exam Questions

Key Topic 1: Equipment Requirements

- 1-1A1 What is a requirement of all marine transmitting apparatus used aboard United States vessels?
- A. Only equipment that has been certified by the FCC for Part 80 operations is authorized.
 - B. Equipment must be type-accepted by the U.S. Coast Guard for maritime mobile use.
 - C. Certification is required by the International Maritime Organization (IMO).
 - D. Programming of all maritime channels must be performed by a licensed Marine Radio Operator.
- 1-1A2 What transmitting equipment is authorized for use by a station in the maritime services?
- A. Transmitters that have been certified by the manufacturer for maritime use.
 - B. Unless specifically excepted, only transmitters certified by the Federal Communications Commission for Part 80 operations.
 - C. Equipment that has been inspected and approved by the U.S. Coast Guard.
 - D. Transceivers and transmitters that meet all ITU specifications for use in maritime mobile service.
- 1-1A3 Small passenger vessels that sail 20 to 150 nautical miles from the nearest land must have what additional equipment?
- A. Inmarsat-B terminal.
 - B. Inmarsat-C terminal.
 - C. Aircraft Transceiver with 121.5 MHz.
 - D. MF-HF SSB Transceiver.
- 1-1A4 What equipment is programmed to initiate transmission of distress alerts and calls to individual stations?
- A. NAVTEX.
 - B. GPS.
 - C. DSC controller.
 - D. Scanning Watch Receiver.
- 1-1A5 What is the minimum transmitter power level required by the FCC for a medium-frequency transmitter aboard a compulsorily fitted vessel?
- A. At least 100 watts, single-sideband, suppressed-carrier power.
 - B. At least 60 watts PEP.
 - C. The power predictably needed to communicate with the nearest public coast station operating on 2182 kHz.
 - D. At least 25 watts delivered into 50 ohms effective resistance when operated with a primary voltage of 13.6 volts DC.
- 1-1A6 Shipboard transmitters using F3E emission (FM voice) may not exceed what carrier power?
- A. 500 watts.
 - B. 250 watts.
 - C. 100 watts.
 - D. 25 watts.

Answer Key: 1-1A1: A 1-1A2: B 1-1A3: D 1-1A4: C 1-1A5: B 1-1A6: D

Key Topic 2: License Requirements

- 1-2A1 Which commercial radio operator license is required to operate a fixed-tuned ship RADAR station with external controls?
- A. A radio operator certificate containing a Ship RADAR Endorsement.
 - B. A Marine Radio Operator Permit or higher.
 - C. Either a First or Second Class Radiotelegraph certificate or a General Radiotelephone Operator License.
 - D. No radio operator authorization is required.
- 1-2A2 When is a Marine Radio Operator Permit or higher license required for aircraft communications?
- A. When operating on frequencies below 30 MHz allocated exclusively to aeronautical mobile services.
 - B. When operating on frequencies above 30 MHz allocated exclusively to aeronautical mobile services.
 - C. When operating on frequencies below 30 MHz not allocated exclusively to aeronautical mobile services.
 - D. When operating on frequencies above 30 MHz not assigned for international use.
- 1-2A3 Which of the following persons are ineligible to be issued a commercial radio operator license?
- A. Individuals who are unable to send and receive correctly by telephone spoken messages in English.
 - B. Handicapped persons with uncorrected disabilities which affect their ability to perform all duties required of commercial radio operators.
 - C. Foreign maritime radio operators unless they are certified by the International Maritime Organization (IMO).
 - D. U.S. Military radio operators who are still on active duty.
- 1-2A4 What are the radio operator requirements of a passenger ship equipped with a GMDSS installation?
- A. The operator must hold a General Radiotelephone Operator License or higher-class license.
 - B. The operator must hold a Restricted Radiotelephone Operator Permit or higher-class license.
 - C. The operator must hold a Marine Radio Operator Permit or higher-class license.
 - D. Two operators on board must hold a GMDSS Radio Operator License or a Restricted GMDSS Radio Operator License, depending on the ship's operating areas.
- 1-2A5 What is the minimum radio operator requirement for ships subject to the Great Lakes Radio Agreement?
- A. Third Class Radiotelegraph Operator's Certificate.
 - B. General Radiotelephone Operator License.
 - C. Marine Radio Operator Permit.
 - D. Restricted Radiotelephone Operator Permit.
- 1-2A6 What is a requirement of every commercial operator on duty and in charge of a transmitting system?
- A. A copy of the Proof-of-Passing Certificate (PPC) must be in the station's records.
 - B. The original license or a photocopy must be posted or in the operator's personal possession and available for inspection.
 - C. The FCC Form 605 certifying the operator's qualifications must be readily available at the transmitting system site.
 - D. A copy of the operator's license must be supplied to the radio station's supervisor as evidence of technical qualification.

Answer Key: 1-2A1: D 1-2A2: C 1-2A3: A 1-2A4: D 1-2A5: C 1-2A6: B

Key Topic 3: Watchkeeping

1-3A1 Radio watches for compulsory radiotelephone stations will include the following:

- A. VHF channel 22a continuous watch at sea.
- B. 121.5 MHz continuous watch at sea.
- C. VHF channel 16 continuous watch.
- D. 500 kHz.

1-3A2 All compulsory equipped cargo ships (except those operating under GMDSS regulations or in a VTS) while being navigated outside of a harbor or port, shall keep a continuous radiotelephone watch on:

- A. 2182 kHz and Ch-16.
- B. 2182 kHz.
- C. Ch-16.
- D. Cargo ships are exempt from radio watch regulations.

1-3A3 What channel must all compulsory, non-GMDSS vessels monitor at all times in the open sea?

- A. Channel 8.
- B. Channel 70.
- C. Channel 6.
- D. Channel 16.

1-3A4 When a watch is required on 2182 kHz, at how many minutes past the hour must a 3 minute silent period be observed?

- A. 00, 30.
- B. 15, 45.
- C. 10, 40.
- D. 05, 35.

1-3A5 Which is true concerning a required watch on VHF Ch-16?

- A. It is compulsory at all times while at sea until further notice, unless the vessel is in a VTS system.
- B. When a vessel is in an A1 sea area and subject to the Bridge-to-Bridge act and in a VTS system, a watch is not required on Ch-16, provided the vessel monitors both Ch-13 and VTS channel.
- C. It is always compulsory in sea areas A2, A3 and A4.
- D. All of the above.

1-3A6 What are the mandatory DSC watchkeeping bands/channels?

- A. VHF Ch-70, 2 MHz MF DSC, 6 MHz DSC and 1 other HF DSC.
- B. 8 MHz HF DSC, 1 other HF DSC, 2 MHz MF DSC and VHF Ch-70.
- C. 2 MHz MF DSC, 8 MHz DSC, VHF Ch-16 and 1 other HF DSC.
- D. None of the above.

Answer Key: 1-3A1: C 1-3A2: A 1-3A3 D 1-3A4: A 1-3A5: D 1-3A6: B

Key Topic 4: Logkeeping

- 1-4A1 Who is required to make entries in a required service or maintenance log?
- The licensed operator or a person whom he or she designates.
 - The operator responsible for the station operation or maintenance.
 - Any commercial radio operator holding at least a Restricted Radiotelephone Operator Permit.
 - The technician who actually makes the adjustments to the equipment.
- 1-4A2 Who is responsible for the proper maintenance of station logs?
- The station licensee.
 - The commercially-licensed radio operator in charge of the station.
 - The ship's master and the station licensee.
 - The station licensee and the radio operator in charge of the station.
- 1-4A3 Where must ship station logs be kept during a voyage?
- At the principal radiotelephone operating position.
 - They must be secured in the vessel's strongbox for safekeeping.
 - In the personal custody of the licensed commercial radio operator.
 - All logs are turned over to the ship's master when the radio operator goes off duty.
- 1-4A4 What is the proper procedure for making a correction in the station log?
- The ship's master must be notified, approve and initial all changes to the station log.
 - The mistake may be erased and the correction made and initialized only by the radio operator making the original error.
 - The original person making the entry must strike out the error, initial the correction and indicate the date of the correction.
 - Rewrite the new entry in its entirety directly below the incorrect notation and initial the change.
- 1-4A5 How long should station logs be retained when there are entries relating to distress or disaster situations?
- Until authorized by the Commission in writing to destroy them.
 - For a period of three years from the last date of entry, unless notified by the FCC.
 - Indefinitely, or until destruction is specifically authorized by the U.S. Coast Guard.
 - For a period of one year from the last date of entry.
- 1-4A6 How long should station logs be retained when there are no entries relating to distress or disaster situations?
- For a period of three years from the last date of entry, unless notified by the FCC.
 - Until authorized by the Commission in writing to destroy them.
 - For a period of two years from the last date of entry.
 - Indefinitely, or until destruction is specifically authorized by the U.S. Coast Guard.

Answer Key: 1-4A1: B 1-4A2: D 1-4A3: A 1-4A4: C 1-4A5: B 1-4A6: C

Key Topic 5: Log Entries

1-5A1 Radiotelephone stations required to keep logs of their transmissions must include:

- A. Station, date and time.
- B. Name of operator on duty.
- C. Station call signs with which communication took place.
- D. All of these.

1-5A2 Which of the following is true?

- A. Battery test must be logged daily.
- B. EPIRB tests are normally logged monthly.
- C. Radiotelephone tests are normally logged weekly.
- D. None of the above.

1-5A3 Where should the GMDSS radio log be kept on board ship?

- A. Captain's office.
- B. Sea cabin.
- C. At the GMDSS operating position.
- D. Anywhere on board the vessel.

1-5A4 Which of the following statements is true?

- A. Key letters or abbreviations may be used in GMDSS Radio Logbooks if their meaning is noted in the log.
- B. Key letters or abbreviations may not be used in GMDSS Radio Logbooks under any circumstances.
- C. All Urgency communications must be entered in the logbook.
- D. None of the above.

1-5A5 Which of the following logkeeping statements is true?

- A. Entries relating to pre-voyage, pre-departure and daily tests are required.
- B. Both a) and c)
- C. A summary of all required Distress communications heard and Urgency communications affecting the station's own ship. Also, all Safety communications (other than VHF) affecting the station's own ship must be logged.
- D. Routine daily MF-HF and Inmarsat-C transmissions do not have to be logged.

1-5A6 Which of the following statements concerning log entries is false?

- A. All Safety communications received on VHF must be logged.
- B. All required equipment tests must be logged.
- C. The radio operator must log on and off watch.
- D. The vessels daily position must be entered in the log.

Key Topic 6: Miscellaneous Rules & Regulations

- 1-6A1 What regulations govern the use and operation of FCC-licensed ship stations in international waters?
- A. The regulations of the International Maritime Organization (IMO) and Radio Officers Union.
 - B. Part 80 of the FCC Rules plus the international Radio Regulations and agreements to which the United States is a party.
 - C. The Maritime Mobile Directives of the International Telecommunication Union.
 - D. Those of the FCC's Wireless Telecommunications Bureau, Maritime Mobile Service, Washington, DC 20554.
- 1-6A2 When may the operator of a ship radio station allow an unlicensed person to speak over the transmitter?
- A. At no time. Only commercially-licensed radio operators may modulate the transmitting apparatus.
 - B. When the station power does not exceed 200 watts peak envelope power.
 - C. When under the supervision of the licensed operator.
 - D. During the hours that the radio officer is normally off duty.
- 1-6A3 Where do you make an application for inspection of a ship GMDSS radio station?
- A. To a Commercial Operator Licensing Examination Manager (COLE Manager).
 - B. To the Federal Communications Commission, Washington, DC 20554.
 - C. To the Engineer-in-Charge of the FCC District Office nearest the proposed place of inspection.
 - D. To an FCC-licensed technician holding a GMDSS Radio Maintainer's License.
- 1-6A4 Who has ultimate control of service at a ship's radio station?
- A. The master of the ship.
 - B. A holder of a First Class Radiotelegraph Certificate with a six months' service endorsement.
 - C. The Radio Officer-in-Charge authorized by the captain of the vessel.
 - D. An appointed licensed radio operator who agrees to comply with all Radio Regulations in force.
- 1-6A5 Where must the principal radiotelephone operating position be installed in a ship station?
- A. At the principal radio operating position of the vessel.
 - B. In the chart room, master's quarters or wheel house.
 - C. In the room or an adjoining room from which the ship is normally steered while at sea.
 - D. At the level of the main wheel house or at least one deck above the ship's main deck.
- 1-6A6 By international agreement, which ships must carry radio equipment for the safety of life at sea?
- A. All ships traveling more than 100 miles out to sea.
 - B. Cargo ships of more than 100 gross tons and passenger vessels on international deep-sea voyages.
 - C. All cargo ships of more than 100 gross tons.
 - D. Cargo ships of more than 300 gross tons and vessels carrying more than 12 passengers.

Answer Key: 1-6A1: B 1-6A2: C 1-6A3: C 1-6A4: A 1-6A5: C 1-6A6: D

Key Topic 7: Bridge-to-Bridge Operations

- 1-7B1 What traffic management service is operated by the U.S. Coast Guard in certain designated water areas to prevent ship collisions, groundings and environmental harm?
- A. Water Safety Management Bureau (WSMB).
 - B. Vessel Traffic Service (VTS).
 - C. Ship Movement and Safety Agency (SMSA).
 - D. Interdepartmental Harbor and Port Patrol (IHPP).
- 1-7B2 What is a bridge-to-bridge station?
- A. An internal communications system linking the wheel house with the ship's primary radio operating position and other integral ship control points.
 - B. An inland waterways and coastal radio station serving ship stations operating within the United States.
 - C. A portable ship station necessary to eliminate frequent application to operate a ship station on board different vessels.
 - D. A VHF radio station located on a ship's navigational bridge or main control station that is used only for navigational communications.
- 1-7B3 When may a bridge-to-bridge transmission be more than 1 watt?
- A. When broadcasting a distress message and rounding a bend in a river or traveling in a blind spot.
 - B. When broadcasting a distress message.
 - C. When rounding a bend in a river or traveling in a blind spot.
 - D. When calling the Coast Guard.
- 1-7B4 When is it legal to transmit high power on Channel 13?
- A. Failure of vessel being called to respond.
 - B. In a blind situation such as rounding a bend in a river.
 - C. During an emergency.
 - D. All of these.
- 1-7B5 A ship station using VHF bridge-to-bridge Channel 13:
- A. May be identified by the name of the ship in lieu of call sign.
 - B. May be identified by call sign and country of origin.
 - C. Must be identified by call sign and name of vessel.
 - D. Does not need to identify itself within 100 miles from shore.
- 1-7B6 The primary purpose of bridge-to-bridge communications is:
- A. Search and rescue emergency calls only.
 - B. All short-range transmission aboard ship.
 - C. Navigational communications.
 - D. Transmission of Captain's orders from the bridge.

Answer Key: 1-7B1: B 1-7B2: D 1-7B3: A 1-7B4: D 1-7B5: A 1-7B6: C

Key Topic 8: Operating Procedures-1

1-8B1 What is the best way for a radio operator to minimize or prevent interference to other stations?

- A. By using an omni-directional antenna pointed away from other stations.
- B. Reducing power to a level that will not affect other on-frequency communications.
- C. Determine that a frequency is not in use by monitoring the frequency before transmitting.
- D. By changing frequency when notified that a radiocommunication causes interference.

1-8B2 Under what circumstances may a coast station using telephony transmit a general call to a group of vessels?

- A. Under no circumstances.
- B. When announcing or preceding the transmission of Distress, Urgency, Safety or other important messages.
- C. When the vessels are located in international waters beyond 12 miles.
- D. When identical traffic is destined for multiple mobile stations within range.

1-8B3 Who determines when a ship station may transmit routine traffic destined for a coast or government station in the maritime mobile service?

- A. Shipboard radio officers may transmit traffic when it will not interfere with ongoing radiocommunications.
- B. The order and time of transmission and permissible type of message traffic is decided by the licensed on-duty operator.
- C. Ship stations must comply with instructions given by the coast or government station.
- D. The precedence of conventional radiocommunications is determined by FCC and international regulation.

1-8B4 What is required of a ship station which has established initial contact with another station on 2182 kHz or Ch-16?

- A. The stations must change to an authorized working frequency for the transmission of messages.
- B. The stations must check the radio channel for Distress, Urgency and Safety calls at least once every ten minutes.
- C. Radiated power must be minimized so as not to interfere with other stations needing to use the channel.
- D. To expedite safety communications, the vessels must observe radio silence for two out of every fifteen minutes.

1-8B5 How does a coast station notify a ship that it has a message for the ship?

- A. By making a directed transmission on 2182 kHz or 156.800 MHz.
- B. The coast station changes to the vessel's known working frequency.
- C. By establishing communications using the eight-digit maritime mobile service identification.
- D. The coast station may transmit, at intervals, lists of call signs in alphabetical order for which they have traffic.

1-8B6 What is the priority of communications?

- A. Safety, Distress, Urgency and radio direction-finding.
- B. Distress, Urgency and Safety.
- C. Distress, Safety, radio direction-finding, search and rescue.
- D. Radio direction-finding, Distress and Safety.

Answer Key: 1-8B1: C 1-8B2: B 1-8B3: C 1-8B4: A 1-8B5: D 1-8B6: B

Key Topic 9: Operating Procedures-2

- 1-9B1 Under what circumstances may a ship or aircraft station interfere with a public coast station?
- A. In cases of distress.
 - B. Under no circumstances during on-going radiocommunications.
 - C. During periods of government priority traffic handling.
 - D. When it is necessary to transmit a message concerning the safety of navigation or important meteorological warnings.
- 1-9B2 Ordinarily, how often would a station using a telephony emission identify?
- A. At least every 10 minutes.
 - B. At the beginning and end of each transmission and at 15-minute intervals.
 - C. At 15-minute intervals, unless public correspondence is in progress.
 - D. At 20-minute intervals.
- 1-9B3 When using a SSB station on 2182 kHz or VHF-FM on channel 16:
- A. Preliminary call must not exceed 30 seconds.
 - B. If contact is not made, you must wait at least 2 minutes before repeating the call.
 - C. Once contact is established, you must switch to a working frequency.
 - D. All of these.
- 1-9B4 What should a station operator do before making a transmission?
- A. Except for the transmission of distress calls, determine that the frequency is not in use by monitoring the frequency before transmitting.
 - B. Transmit a general notification that the operator wishes to utilize the channel.
 - C. Check transmitting equipment to be certain it is properly calibrated.
 - D. Ask if the frequency is in use.
- 1-9B5 On what frequency should a ship station normally call a coast station when using a radiotelephony emission?
- A. On a vacant radio channel determined by the licensed radio officer.
 - B. Calls should be initiated on the appropriate ship-to-shore working frequency of the coast station.
 - C. On any calling frequency internationally approved for use within ITU Region 2.
 - D. On 2182 kHz or Ch-16 at any time.
- 1-9B6 In the International Phonetic Alphabet, the letters E, M, and S are represented by the words:
- A. Echo, Michigan, Sonar.
 - B. Equator, Mike, Sonar.
 - C. Echo, Mike, Sierra
 - D. Element, Mister, Scooter

Answer Key: 1-9B1: A 1-9B2: B 1-9B3: D 1-9B4: A 1-9B5: B 1-9B6: C

Key Topic 10: Distress Communications

1-10B1 What information must be included in a Distress message?

- A. Name of vessel.
- B. Location.
- C. Type of distress and specifics of help requested.
- D. All of the above.

1-10B2 What are the highest priority communications from ships at sea?

- A. All critical message traffic authorized by the ship's master.
- B. Navigation and meteorological warnings.
- C. Distress calls are highest and then communications preceded by Urgency and then Safety signals.
- D. Authorized government communications for which priority right has been claimed.

1-10B3 What is a Distress communication?

- A. Communications indicating that the calling station has a very urgent message concerning safety.
- B. An internationally recognized communication indicating that the sender is threatened by grave and imminent danger and requests immediate assistance.
- C. Radio communications which, if delayed, will adversely affect the safety of life or property.
- D. An official radio communication notification of approaching navigational or meteorological hazards.

1-10B4 What is the order of priority of radiotelephone communications in the maritime services?

- A. Alarm and health and welfare communications.
- B. Navigation hazards, meteorological warnings, priority traffic.
- C. Distress calls and signals, followed by communications preceded by Urgency and Safety signals and all other communications.
- D. Government precedence, messages concerning safety of life and protection of property, and traffic concerning grave and imminent danger.

1-10B5 The radiotelephone Distress call and message consists of:

- A. MAYDAY spoken three times, followed by the name of the vessel and the call sign in phonetics spoken three times.
- B. Particulars of its position, latitude and longitude, and other information which might facilitate rescue, such as length, color and type of vessel, and number of persons on board.
- C. Nature of distress and kind of assistance required.
- D. All of the above.

1-10B6 What is Distress traffic?

- A. All messages relative to the immediate assistance required by a ship, aircraft or other vehicle threatened by grave or imminent danger, such as life and safety of persons on board, or man overboard.
- B. In radiotelephony, the speaking of the word, "Mayday."
- C. Health and welfare messages concerning property and the safety of a vessel.
- D. Internationally recognized communications relating to important situations.

Answer Key: 1-10B1: D 1-10B2: C 1-10B3: B 1-10B4: C 1-10B5: D 1-10B6 A

Key Topic 11: Urgency and Safety Communications

1-11B1 What is a typical Urgency transmission?

- A. A request for medical assistance that does not rise to the level of a Distress or a critical weather transmission higher than Safety.
- B. A radio Distress transmission affecting the security of humans or property.
- C. Health and welfare traffic which impacts the protection of on-board personnel.
- D. A communications alert that important personal messages must be transmitted.

1-11B2 What is the internationally recognized Urgency signal?

- A. The letters "TTT" transmitted three times by radiotelegraphy.
- B. The words "PAN PAN" spoken three times before the Urgency call.
- C. Three oral repetitions of the word "Safety" sent before the call.
- D. The pronouncement of the word "Mayday."

1-11B3 What is a Safety transmission?

- A. A communications transmission which indicates that a station is preparing to transmit an important navigation or weather warning.
- B. A radiotelephony warning preceded by the words "PAN PAN."
- C. Health and welfare traffic concerning the protection of human life.
- D. A voice call preceded by the words "Safety Alert."

1-11B4 The Urgency signal concerning the safety of a ship, aircraft or person shall be sent only on the authority of:

- A. Master of ship.
- B. Person responsible for mobile station.
- C. Either Master of ship or person responsible for mobile station.
- D. An FCC-licensed operator.

1-11B5 The Urgency signal has lower priority than:

- A. Ship-to-ship routine calls.
- B. Distress.
- C. Safety.
- D. Security.

1-11B6 What safety signal call word is spoken three times, followed by the station call letters spoken three times, to announce a storm warning, danger to navigation, or special aid to navigation?

- A. PAN PAN.
- B. MAYDAY.
- C. SAFETY.
- D. SECURITE.

Answer Key: 1-11B1: A 1-11B2: B 1-11B3: A 1-11B4: C 1-11B5: B 1-11B6: D

Key Topic 12: GMDSS

1-12B1 What is the fundamental concept of the GMDSS?

- A. It is intended to automate and improve existing digital selective calling procedures and techniques.
- B. It is intended to provide more effective but lower cost commercial communications.
- C. It is intended to provide compulsory vessels with a collision avoidance system when they are operating in waters that are also occupied by non-compulsory vessels.
- D. It is intended to automate and improve emergency communications in the maritime industry.

1-12B2 The primary purpose of the GMDSS is to:

- A. Allow more effective control of SAR situations by vessels.
- B. Provide additional shipboard systems for more effective company communications.
- C. Automate and improve emergency communications for the world's shipping industry.
- D. Provide effective and inexpensive communications.

1-12B3 What is the basic concept of GMDSS?

- A. Shoreside authorities and vessels can assist in a coordinated SAR operation with minimum delay.
- B. Search and rescue authorities ashore can be alerted to a Distress situation.
- C. Shipping in the immediate vicinity of a ship in Distress will be rapidly alerted.
- D. All of these.

1-12B4 GMDSS is primarily a system based on?

- A. Ship-to-ship Distress communications using MF or HF radiotelephony.
- B. VHF digital selective calling from ship to shore.
- C. Distress, Urgency and Safety communications carried out by the use of narrow-band direct printing telegraphy.
- D. The linking of search and rescue authorities ashore with shipping in the immediate vicinity of a ship in Distress or in need of assistance.

1-12B5 What is the responsibility of vessels under GMDSS?

- A. Vessels over 300 gross tons may be required to render assistance if such assistance does not adversely affect their port schedule.
- B. Only that vessel, regardless of size, closest to a vessel in Distress, is required to render assistance.
- C. Every ship is able to perform those communications functions that are essential for the Safety of the ship itself and of other ships.
- D. Vessels operating under GMDSS, outside of areas effectively serviced by shoreside authorities, operating in sea areas A2, and A4 may be required to render assistance in Distress situations.

1-12B6 GMDSS is required for which of the following?

- A. All vessels capable of international voyages.
- B. SOLAS Convention ships of 300 gross tonnage or more.
- C. Vessels operating outside of the range of VHF coastal radio stations.
- D. Coastal vessels of less than 300 gross tons.

Answer Key: 1-12B1: D 1-12B2: C 1-12B3: D 1-12B4: D 1-12B5: C 1-12B6: B

Key Topic 13: VHF Equipment Controls

1-13C1 What is the purpose of the INT-USA control settings on a VHF?

- A. To change all VTS frequencies to Duplex so all vessels can receive maneuvering orders.
- B. To change all VHF channels from Duplex to Simplex while in U.S. waters.
- C. To change certain International Duplex channel assignments to simplex in the U.S. for VTS and other purposes.
- D. To change to NOAA weather channels and receive weather broadcasts while in the U.S.

1-13C2 VHF ship station transmitters must have the capability of reducing carrier power to:

- A. 1 watt.
- B. 10 watts.
- C. 25 watts.
- D. 50 watts.

1-13C3 The Dual Watch (DW) function is used to:

- A. Listen to Ch-70 at the same time while monitoring Ch-16.
- B. Sequentially monitor 4 different channels.
- C. Sequentially monitoring all VHF channels.
- D. Listen on any selected channel while periodically monitoring Ch-16.

1-13C4 Which of the following statements best describes the correct setting for manual adjustment of the squelch control?

- A. Adjust squelch control to the minimum level necessary to barely suppress any background noise.
- B. Always adjust squelch control to its maximum level.
- C. Always adjust squelch control to its minimum level.
- D. Adjust squelch control to approximately twice the minimum level necessary to barely suppress any background noise.

1-13C5 The "Scan" function is used to:

- A. Monitor Ch-16 continuously and switching to either Ch-70 or Ch-13 every 5 seconds.
- B. Scan Ch-16 for Distress calls.
- C. Scan Ch-70 for Distress alerts.
- D. Sequentially scan all or selected channels.

1-13C6 Why must all VHF Distress, Urgency and Safety communications (as well as VTS traffic calls) be performed in Simplex operating mode?

- A. To minimize interference from vessels engaged in routine communications.
- B. To ensure that vessels not directly participating in the communications can hear both sides of the radio exchange.
- C. To enable an RCC or Coast station to only hear communications from the vessel actually in distress.
- D. To allow an RCC or Coast station to determine which transmissions are from other vessels and which transmissions are from the vessel actually in distress.

Answer Key: 1-13C1: C 1-13C2: A 1-13C3: D 1-13C4: A 1-13C5: D 1-13C6: B

Key Topic 14: VHF Channel Selection

1-14C1 What channel must VHF-FM-equipped vessels monitor at all times when the vessel is at sea?

- A. Channel 8.
- B. Channel 16.
- C. Channel 5A.
- D. Channel 1A.

1-14C2 What is the aircraft frequency and emission used for distress communications?

- A. 243.000 MHz - F3E.
- B. 121.500 MHz - F3E.
- C. 156.525 MHz - F1B.
- D. 121.500 MHz - A3E.

1-14C3 Which VHF channel is used only for digital selective calling?

- A. Channel 70.
- B. Channel 16.
- C. Channel 22A.
- D. Channel 6.

1-14C4 Which channel is utilized for the required bridge-to-bridge watch?

- A. DSC on Ch-70.
- B. VHF-FM on Ch-16.
- C. VHF-FM on Ch-13 in most areas of the continental United States.
- D. The vessel's VHF working frequency.

1-14C5 Which channel would most likely be used for routine ship-to-ship voice traffic?

- A. Ch-16.
- B. Ch-08.
- C. Ch-70.
- D. Ch-22A.

1-14C6 What channel would you use to place a call to a shore telephone?

- A. Ch-16.
- B. Ch-70.
- C. Ch-28.
- D. Ch-06.

Answer Key: 1-14C1: B 1-14C2: D 1-14C3: A 1-14C4: C 1-14C5: B 1-14C6: C

Key Topic 15: MF-HF Equipment Controls

1-15C1 Which modes could be selected to receive vessel traffic lists from high seas shore stations?

- A. AM and VHF-FM.
- B. ARQ and FEC.
- C. VHF-FM and SSB.
- D. SSB and FEC.

1-15C2 Why must all MF-HF Distress, Urgency and Safety communications take place solely on the 6 assigned frequencies and in the simplex operating mode?

- A. For non-GMDSS ships, to maximize the chances for other vessels to receive those communications.
- B. Answers a) and c) are both correct.
- C. For GMDSS or DSC-equipped ships, to maximize the chances for other vessels to receive those communications following the transmission of a DSC call of the correct priority.
- D. To enable an RCC or Coast station to only hear communications from the vessel actually in distress.

1-15C3 To set-up the MF/HF transceiver for a voice call to a coast station, the operator must:

- A. Select J3E mode for proper SITOR operations.
- B. Select F1B mode or J2B mode, depending on the equipment manufacturer.
- C. Select J3E mode for proper voice operations.
- D. Select F1B/J2B modes or J3E mode, depending on whether FEC or ARQ is preferred.

1-15C4 MF/HF transceiver power levels should be set:

- A. To the lowest level necessary for effective communications.
- B. To the level necessary to maximize the propagation radius.
- C. To the highest level possible so as to ensure other stations cannot “break-in” on the channel during use.
- D. Both a) and c) are correct.

1-15C5 To set-up the MF/HF transceiver for a TELEX call to a coast station, the operator must:

- A. Select J3E mode for proper SITOR operations.
- B. Select F1B mode or J2B mode, depending on the equipment manufacturer.
- C. Select F1B/J2B modes or J3E mode, depending on whether ARQ or FEC is preferred.
- D. None of the above.

1-15C6 What is the purpose of the Receiver Incremental Tuning (RIT) or “Clarifier” control?

- A. It acts as a “fine-tune” control on the receive frequency.
- B. It acts as a “fine-tune” control on the transmitted frequency.
- C. It acts as a “fine-tune” control on both the receive and transmitted frequencies.
- D. None of the above.

Answer Key: 1-15C1: D 1-15C2: B 1-15C3: C 1-15C4: A 1-15C5: B 1-15C6: A

Key Topic 16: MF-HF Frequency & Emission Selection

- 1-16C1 On what frequency would a vessel normally call another ship station when using a radiotelephony emission?
- A. Only on 2182 kHz in ITU Region 2.
 - B. On 2182 kHz or Ch-16, unless the station knows that the called vessel maintains a simultaneous watch on another intership working frequency.
 - C. On the appropriate calling channel of the ship station at 15 minutes past the hour.
 - D. On the vessel's unique working radio channel assigned by the Federal Communications Commission.
- 1-16C2 What is the MF radiotelephony calling and Distress frequency?
- A. 2670 kHz.
 - B. Ch-06 VHF.
 - C. 2182 kHz.
 - D. Ch-22 VHF.
- 1-16C3 For general communications purposes, paired frequencies are:
- A. Normally used with private coast stations.
 - B. Normally used between ship stations.
 - C. Normally used between private coast and ship stations.
 - D. Normally used with public coast stations.
- 1-16C4 What emission must be used when operating on the MF distress and calling voice frequency?
- A. J3E – Single sideband telephony.
 - B. A1A – On-off keying without modulation by an audio frequency.
 - C. F3E – Frequency modulation telephony.
 - D. A3E – Amplitude modulation telephony, double sideband.
- 1-16C5 Which of the following defines high frequency "ITU Channel 1212"?
- A. Ch-12 in the 16 MHz band.
 - B. Ch-1216 in the MF band.
 - C. The 12th channel in the 12 MHz band.
 - D. This would indicate the 1st channel in the 12 MHz band.
- 1-16C6 For general communications purposes, simplex frequencies are:
- A. Normally used between ship stations and private coast stations.
 - B. Normally used with public coast stations.
 - C. Normally used between ship stations.
 - D. Both a) and c) are correct.

Answer Key: 1-16C1: B 1-16C2: C 1-16C3: D 1-16C4: A 1-16C5: C 1-16C6: D

Key Topic 17: Equipment Tests

- 1-17C1 What is the proper procedure for testing a radiotelephone installation?
- A. A dummy antenna must be used to insure the test will not interfere with ongoing communications.
 - B. Transmit the station's call sign, followed by the word "test" on the frequency being used for the test.
 - C. Permission for the voice test must be requested and received from the nearest public coast station.
 - D. Short tests must be confined to a single frequency and must never be conducted in port.
- 1-17C2 When testing is conducted on 2182 kHz or Ch-16, testing should not continue for more than _____ in any 5-minute period.
- A. 2 minutes.
 - B. 1 minute.
 - C. 30 seconds.
 - D. 10 seconds.
- 1-17C3 Under GMDSS, a compulsory VHF-DSC radiotelephone installation must be tested at what minimum intervals at sea?
- A. Daily.
 - B. Annually, by a representative of the FCC.
 - C. Weekly.
 - D. Monthly.
- 1-17C4 The best way to test the MF-HF NBDP system is?
- A. Make a radiotelephone call to a coast station.
 - B. Initiate an ARQ call to demonstrate that the transmitter and antenna are working.
 - C. Initiate an FEC call to demonstrate that the transmitter and antenna are working.
 - D. Initiate an ARQ call to a Coast Station and wait for the automatic exchange of answerbacks.
- 1-17C5 The best way to test the Inmarsat-C terminal is?
- A. Compose and send a brief message to your own Inmarsat-C terminal.
 - B. Send a message to a shore terminal and wait for confirmation.
 - C. Send a message to another ship terminal.
 - D. If the "Send" light flashes, proper operation has been confirmed.
- 1-17C6 When may you test a radiotelephone transmitter on the air?
- A. Between midnight and 6:00 AM local time.
 - B. Only when authorized by the Commission.
 - C. At any time (except during silent periods) as necessary to assure proper operation.
 - D. After reducing transmitter power to 1 watt.

Answer Key: 1-17C1: B 1-17C2: D 1-17C3: A 1-17C4: D 1-17C5: A 1-17C6: C

Key Topic 18: Equipment Faults

- 1-18C1 Under normal circumstances, what do you do if the transmitter aboard your ship is operating off-frequency, overmodulating or distorting?
- A. Reduce to low power.
 - B. Reduce audio volume level.
 - C. Stop transmitting.
 - D. Make a notation in station operating log.
- 1-18C2 Which would be an indication of proper operation of a SSB transmitter rated at 60 watt PEP output?
- A. In SSB (J3E) voice mode, with the transmitter keyed but without speaking into the microphone, power output is indicated.
 - B. In SITOR communications, the power meter can be seen fluctuating regularly from zero to the 60 watt relative output reading.
 - C. In SSB (J3E) mode, speaking into the microphone causes power meter to fluctuate slightly around the 60 watt reading.
 - D. A steady indication of transmitted energy on an RF Power meter with no fluctuations when speaking into the microphone.
- 1-18C3 If a ship radio transmitter signal becomes distorted:
- A. Reduce transmitter power.
 - B. Use minimum modulation.
 - C. Cease operations.
 - D. Reduce audio amplitude.
- 1-18C4 What would be an indication of a malfunction on a GMDSS station with a 24 VDC battery system?
- A. A constant 30 volt reading on the GMDSS console voltmeter.
 - B. After testing the station on battery power, the ammeter reading indicates a high rate of charge that then declines.
 - C. After testing the station on battery power, a voltmeter reading of 30 volts for brief period followed by a steady 26 volt reading.
 - D. None of the above.
- 1-18C5 Your antenna tuner becomes totally inoperative. What would you do to obtain operation on both the 8 MHz and 22 MHz frequency bands?
- A. Without an operating antenna tuner, transmission is impossible.
 - B. It is impossible to obtain operation on 2 different HF bands, without an operating antenna tuner.
 - C. Bypass the antenna tuner and shorten the whip to 15 ft.
 - D. Bypass the antenna tuner. Use a straight whip or wire antenna approximately 30 ft long.
- 1-18C6 Which of the following conditions would be a symptom of malfunction in a 2182 kHz radiotelephone system that must be reported to the Master, then logged appropriately.
- A. Much higher noise level observed during daytime operation.
 - B. No indication of power output when speaking into the microphone.
 - C. When testing a radiotelephone alarm on 2182 kHz into an artificial antenna, the Distress frequency watch receiver becomes unmuted, an improper testing procedure.
 - D. Failure to contact a shore station 600 nautical miles distant during daytime operation.

Answer Key: 1-18C1: C 1-18C2: B 1-18C3: C 1-18C4: A 1-18C5: D 1-18C6: B

Key Topic 19: Antennas

- 1-19D1 What are the antenna requirements of a VHF telephony coast, maritime utility or ship station?
- A. The shore or on-board antenna must be vertically polarized.
 - B. The antenna array must be type-accepted for 30-200 MHz operation by the FCC.
 - C. The horizontally-polarized antenna must be positioned so as not to cause excessive interference to other stations.
 - D. The antenna must be capable of being energized by an output in excess of 100 watts.
- 1-19D2 What is the antenna requirement of a radiotelephone installation aboard a passenger vessel?
- A. The antenna must be located a minimum of 15 meters from the radiotelegraph antenna.
 - B. The antenna must be vertically polarized and as non-directional and efficient as is practicable for the transmission and reception of ground waves over seawater.
 - C. An emergency reserve antenna system must be provided for communications on 156.800 MHz.
 - D. All antennas must be tested and the operational results logged at least once during each voyage.
- 1-19D3 What is the most common type of antenna for GMDSS VHF?
- A. Horizontally polarized circular antenna.
 - B. Long wire antenna.
 - C. Both of the above.
 - D. None of the above.
- 1-19D4 What is the purpose of the antenna tuner?
- A. It alters the electrical characteristics of the antenna to match the frequency in use.
 - B. It physically alters the length of the antenna to match the frequency in use.
 - C. It makes the antenna look like a half-wave antenna at the frequency in use.
 - D. None of the above.
- 1-19D5 What advantage does a vertical whip have over a long wire?
- A. It radiates more signal fore and aft.
 - B. It radiates equally well in all directions.
 - C. It radiates a strong signal vertically.
 - D. None of the above.
- 1-19D6 A vertical whip antenna has a radiation pattern best described by?
- A. A figure eight.
 - B. A cardioid.
 - C. A circle.
 - D. An ellipse.

Answer Key: 1-19D1: A 1-19D2: B 1-19D3: D 1-19D4: A 1-19D5: B 1-19D6: C

Key Topic 20: Power Sources

1-20D1 For a small passenger vessel inspection, reserve power batteries must be tested:

- A. At intervals not exceeding every 3 months.
- B. At intervals not exceeding every 6 months
- C. Before any new voyage
- D. At intervals not exceeding 12 months, or during the inspection.

1-20D2 What are the characteristics of the Reserve Source of Energy under GMDSS?

- A. Supplies independent HF and MF installations at the same time.
- B. Cannot be independent of the propelling power of the ship.
- C. Must be independent of the ship's electrical system when the RSE is needed to supply power to the GMDSS equipment.
- D. Must be incorporated into the ship's electrical system.

1-20D3 Which of the following terms is defined as a back-up power source that provides power to radio installations for the purpose of conducting Distress and Safety communications when the vessel's main and emergency generators cannot?

- A. Emergency Diesel Generator.
- B. Reserve Source of Energy.
- C. Reserve Source of Diesel Power.
- D. Emergency Back-up Generator.

1-20D4 In the event of failure of the main and emergency sources of electrical power, what is the term for the source required to supply the GMDSS console with power for conducting distress and other radio communications?

- A. Emergency power.
- B. Ship's emergency diesel generator.
- C. Reserve source of energy.
- D. Ship's standby generator

1-20D5 What is the requirement for emergency and reserve power in GMDSS radio installations?

- A. An emergency power source for radio communications is not required if a vessel has proper reserve power (batteries).
- B. A reserve power source is not required for radio communications.
- C. Only one of the above is required if a vessel is equipped with a second 406 EPIRB as a backup means of sending a distress alert.
- D. All newly constructed ships under GMDSS must have both emergency and reserve power sources for radio communications.

1-20D6 What is the meaning of "Reserve Source of Energy"?

- A. The supply of electrical energy sufficient to operate the radio installations for the purpose of conducting Distress and Safety communications in the event of failure of the ship's main and emergency sources of electrical power.
- B. High caloric value items for lifeboat, per SOLAS regulations.
- C. Diesel fuel stored for the purpose of operating the powered survival craft for a period equal to or exceeding the U.S.C.G. and SOLAS requirements.
- D. None of these.

Answer Key: 1-20D1: D 1-20D2: C 1-20D3: B 1-20D4: C 1-20D5: D 1-20D6: A

Key Topic 21: EPIRBs

1-21D1 What is an EPIRB?

- A. A battery-operated emergency position-indicating radio beacon that floats free of a sinking ship.
- B. An alerting device notifying mariners of imminent danger.
- C. A satellite-based maritime distress and safety alerting system.
- D. A high-efficiency audio amplifier.

1-21D2 When are EPIRB batteries changed?

- A. After emergency use; after battery life expires.
- B. After emergency use or within the month and year replacement date printed on the EPIRB.
- C. After emergency use; every 12 months when not used.
- D. Whenever voltage drops to less than 20% of full charge.

1-21D3 If a ship sinks, what device is designed to float free of the mother ship, is turned on automatically and transmits a distress signal?

- A. An emergency position indicating radio beacon.
- B. EPIRB on 2182 kHz and 405.025 kHz.
- C. Bridge-to-bridge transmitter on 2182 kHz.
- D. Auto alarm keyer on any frequency.

1-21D4 How do you cancel a false EPIRB distress alert?

- A. Transmit a DSC distress alert cancellation.
- B. Transmit a broadcast message to "all stations" canceling the distress message.
- C. Notify the Coast Guard or rescue coordination center at once.
- D. Make a radiotelephony "distress cancellation" transmission on 2182 kHz.

1-21D5 What is the COSPAS-SARSAT system?

- A. A global satellite communications system for users in the maritime, land and aeronautical mobile services.
- B. An international satellite-based search and rescue system.
- C. A broadband military satellite communications network.
- D. A Wide Area Geostationary Satellite program (WAGS).

1-21D6 What is an advantage of a 406 MHz satellite EPIRB?

- A. It is compatible with the COSPAS-SARSAT Satellites and Global Maritime Distress Safety System (GMDSS) regulations.
- B. Provides a fast, accurate method for the Coast Guard to locating and rescuing persons in distress.
- C. Includes a digitally encoded message containing the ship's identity and nationality.
- D. All of the above.

Answer Key: 1-21D1: A 1-21D2: B 1-21D3: A 1-21D4: C 1-21D5: B 1-21D6: D

Key Topic 22: SARTs

- 1-22D1 In which frequency band does a search and rescue transponder operate?
- A. 3 GHz.
 - B. S-band.
 - C. 406 MHz.
 - D. 9 GHz.
- 1-22D2 How should the signal from a Search And Rescue Radar Transponder appear on a RADAR display?
- A. A series of dashes.
 - B. A series of spirals all originating from the range and bearing of the SART.
 - C. A series of 12 equally spaced dots.
 - D. A series of twenty dashes.
- 1-22D3 What is the purpose of the SART's audible tone alarm?
- A. It informs survivors that assistance may be nearby.
 - B. It informs survivors when the battery's charge condition has weakened.
 - C. It informs survivors when the SART switches to the "standby" mode.
 - D. It informs survivors that a nearby vessel is signaling on DSC.
- 1-22D4 Which statement is true regarding the SART?
- A. This is a performance monitor attached to at least one S-band navigational RADAR system.
 - B. This is a 9 GHz transponder capable of being received by another vessel's S-band navigational RADAR system.
 - C. This is a performance monitor attached to at least one X-band navigational RADAR system.
 - D. This is a 9 GHz transponder capable of being received by vessel's X-band navigational RADAR system.
- 1-22D5 At what point does a SART begin transmitting?
- A. It immediately begins radiating when placed in the "on" position.
 - B. It must be manually activated.
 - C. If it has been placed in the "on" position, it will respond when it has been interrogated by a 9-GHz RADAR signal.
 - D. If it has been placed in the "on" position, it will begin transmitting immediately upon detecting that it is in water.
- 1-22D6 How can a SART's effective range be maximized?
- A. The SART should be placed in water immediately upon activation.
 - B. The SART should be held as high as possible.
 - C. Switch the SART into the "high" power position.
 - D. If possible, the SART should be mounted horizontally so that its signal matches that of the searching RADAR signal.

Answer Key: 1-22D1: D 1-22D2: C 1-22D3: A 1-22D4: D 1-22D5: C 1-22D6: B

Key Topic 23: Survival Craft VHF

1-23D1 Which statement is NOT true regarding the requirements of survival craft portable two-way VHF radiotelephone equipment?

- A. Watertight to a depth of 1 meter for 5 minutes.
- B. Effective radiated power should be a minimum of 0.25 watts.
- C. Operates simplex on Ch-70 and at least one other channel.
- D. The antenna is fixed and non-removable.

1-23D2 Which statement is NOT true regarding the requirements of survival craft portable two-way VHF radiotelephone equipment?

- A. Operation on Ch-13.
- B. Effective radiated power should be a minimum of 0.25 Watts.
- C. Simplex voice communications only.
- D. Operation on Ch-16.

1-23D3 With what other stations may portable survival craft transceivers communicate?

- A. Communication is permitted between survival craft.
- B. Communication is permitted between survival craft and ship.
- C. Communication is permitted between survival craft and rescue unit.
- D. All of the above.

1-23D4 Equipment for radiotelephony use in survival craft stations under GMDSS must have what capability?

- A. Operation on Ch-16.
- B. Operation on 457.525 MHz.
- C. Operation on 121.5 MHz.
- D. Any one of these.

1-23D5 Equipment for radiotelephony use in survival craft stations under GMDSS must have what characteristic(s)?

- A. Operation on Ch-16.
- B. Watertight.
- C. Permanently-affixed antenna.
- D. All of these.

1-23D6 What is the minimum power of the SCT

- A. Five watts.
- B. One watt.
- C. ¼ watt.
- D. None of the above.

Answer Key: 1-23D1: C 1-23D2: A 1-23D3: D 1-23D4: A 1-23D5: D 1-23D6: B

Key Topic 24: NAVTEX

1-24D1 NAVTEX broadcasts are sent:

- A. Immediately following traffic lists.
- B. In categories of messages indicated by a single letter or identifier.
- C. On request of maritime mobile stations.
- D. Regularly, after the radiotelephone silent periods.

1-24D2 MSI can be obtained by one (or more) of the following:

- A. NAVTEX.
- B. SafetyNET.
- C. HF NBDP.
- D. All of the above.

1-24D3 Which of the following is the primary frequency that is used exclusively for NAVTEX broadcasts internationally?

- A. 518 kHz.
- B. 2187.5 kHz.
- C. 4209.5 kHz.
- D. VHF channel 16 when the vessel is sailing in Sea Area A1, and 2187.5 kHz when in Sea Area A2.

1-24D4 What means are used to prevent the reception of unwanted broadcasts by vessels utilizing the NAVTEX system?

- A. Operating the receiver only during daytime hours.
- B. Coordinating reception with published broadcast schedules.
- C. Programming the receiver to reject unwanted broadcasts.
- D. Automatic receiver de-sensitization during night hours.

1-24D5 When do NAVTEX broadcasts typically achieve maximum transmitting range?

- A. Local noontime.
- B. Middle of the night.
- C. Sunset.
- D. Post sunrise.

1-24D6 What is the transmitting range of most NAVTEX stations?

- A. Typically 50-100 nautical miles (90-180 km) from shore.
- B. Typically upwards of 1000 nautical miles (1800 km) during the daytime.
- C. Typically 200-400 nautical miles (360-720 km).
- D. It is limited to line-of-sight or about 30 nautical miles (54 km).

Answer Key: 1-24D1: B 1-24D2: D 1-24D3: A 1-24D4: C 1-24D5: B 1-24D6: C

[END OF PROPOSED 2009 FCC COMMERCIAL ELEMENT 1 QUESTION POOL]