

# GMDSS

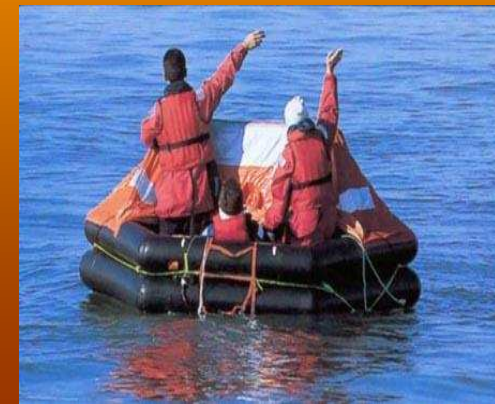
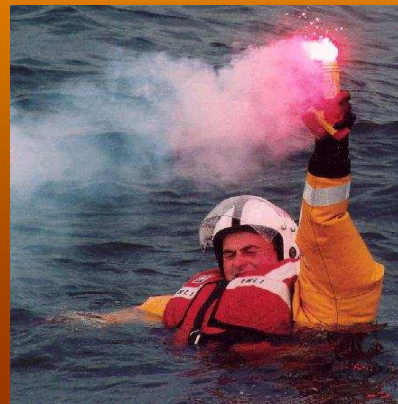
## Global Maritime Distress and Safety System



This will enable the student to know the basic emergency and distress procedures by INMARSAT System, Radio communications and Search and Rescue

# GMDSS

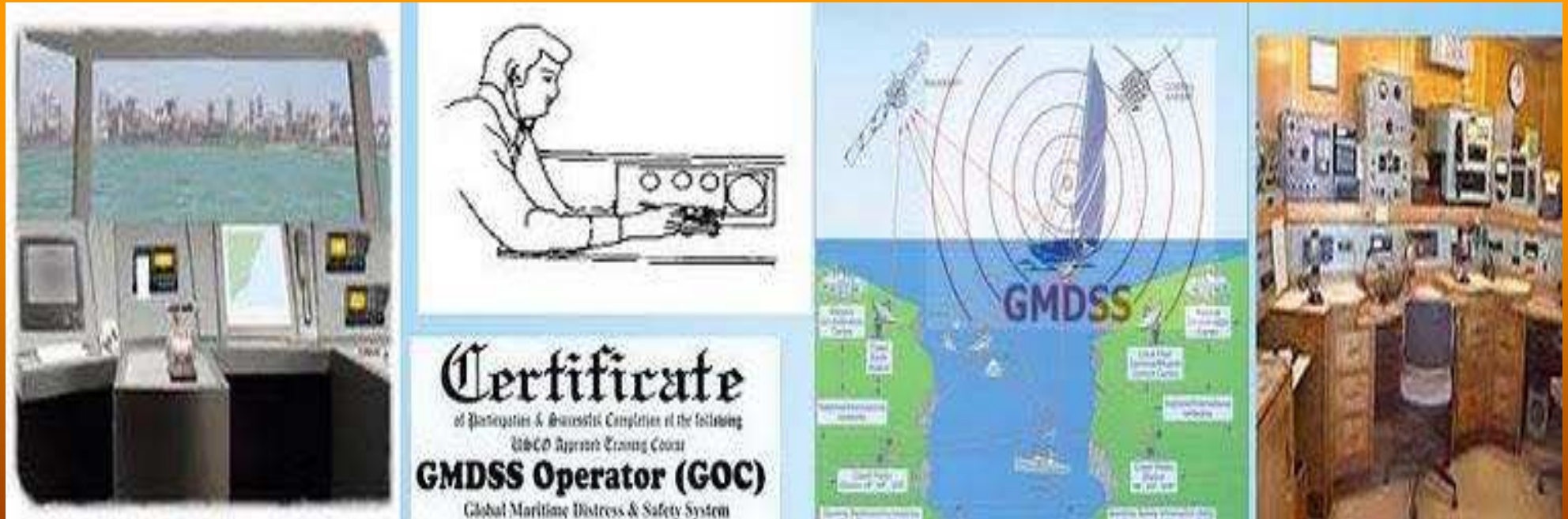
The GMDSS offers the greatest advancement in maritime safety since the enactment of regulations following the Titanic disaster in 1912 . GMDSS is a global coverage and arrangement of communication systems for maritime distress and safety communication that search and rescue authorities, as well as shipping in the immediate vicinity of the ship or person in distress, as well be rapid alerted, so that they can assist in a coordinated search and rescue operation in minimum delay.



# GMDSS History

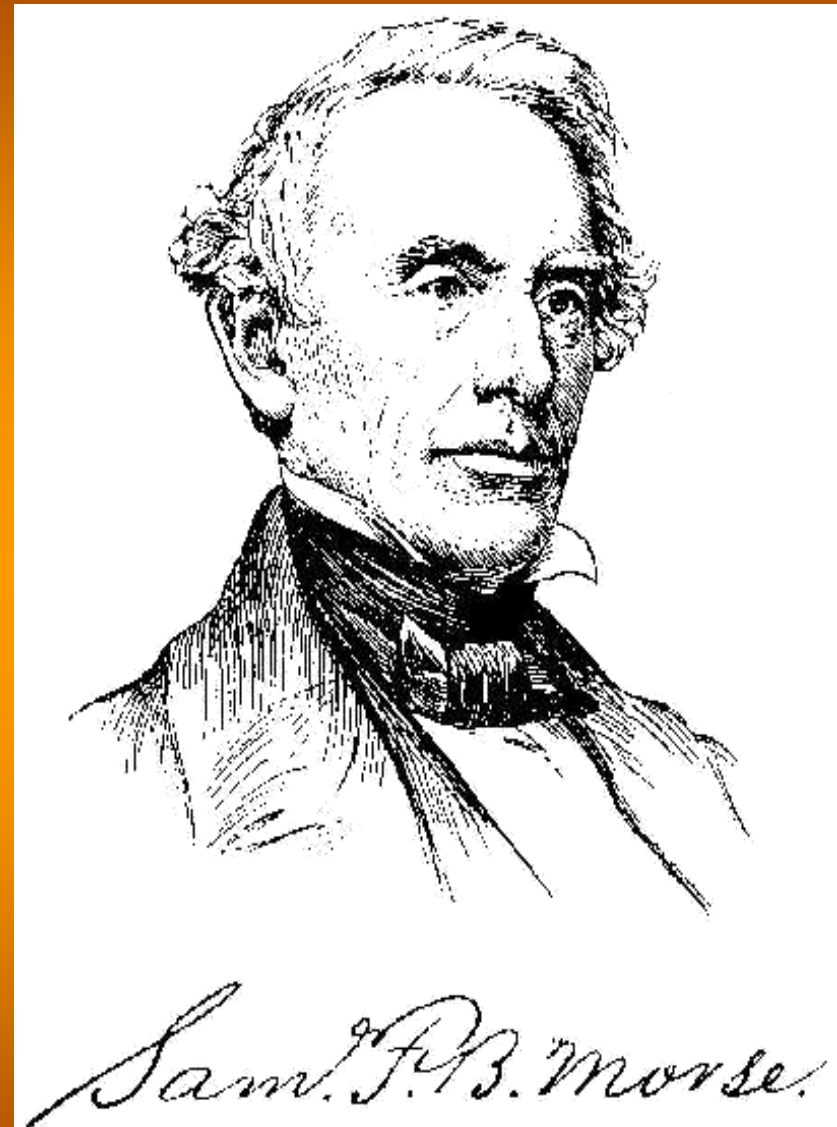
The **Global Maritime Distress and Safety System (GMDSS)** represents a significant improvement in marine safety over the previous system of short range and high seas radio transmissions. Its many parts include satellite as well as advanced terrestrial communications systems.

**SOLAS 74/78 – Chapter IV** contains the GMDSS provisions, which entered into on force **01 February 1992**, with full implementation scheduled by **1 February 1999**.



# GMDSS History

Samuel Finley Breeze Morse was born in Charlestown, Mass. on 27th April 1791. He was not a scientist - he was a professional artist. Educated at Phillip's Academy at Andover, he graduated from Yale in 1810 and he lived in England from 1811 to 1815, exhibiting at the Royal Academy in 1813. He spent the next ten years as an itinerant artist with a particular interest in portraiture. He returned to America in 1832 having been appointed Professor of Painting and Sculpture at the University of the City of New York. It was on this homeward voyage that he overheard a shipboard discussion on electromagnets. This was the seed out of which the electric telegraph grew. Morse is remembered for his Code, still used, and less for the invention that enabled it to be used, probably since landline telegraphy eventually gave way to wireless telegraphy.



# GMDSS History

Since the invention of the radio at the end of the 19th century, ships at sea have relied on **MORSE CODE**, invented by **SAMUEL MORSE** and first used in 1844, for distress and safety telecommunications. The need for ship and coast radio stations to have and use radiotelegraph equipment, and to listen to a common radio frequency for Morse encoded distress calls, was recognized after the sinking of the liner **RMS TITANIC** in the North Atlantic in 1912.



	American (Morse)	Continental (Gerke)	International (ITU)
A	••	••••	••
Å		•••••	
B	•••••	•••••	•••••
C	••••	•••••	•••••
CH		•••••	•••••
D	••••	••••	••••
E	••	••	••
F	••••	••••	••••
G	•••••	•••••	•••••
H	•••••	•••••	•••••
I	••	••	••
J	•••••	•••••	•••••
K	•••••	•••••	•••••
L	•••••	•••••	•••••
M	•••••	•••••	•••••
N	••••	••••	••••
O	••••	••••	••••
Ö		•••••	
P	•••••	•••••	•••••
Q	•••••	•••••	•••••
R	•••••	•••••	•••••
S	••••	••••	••••
T	••••	••••	••••
U	••••	••••	••••
Ü		•••••	
V	•••••	•••••	•••••
W	•••••	•••••	•••••
X	•••••	•••••	•••••
Y	•••••	•••••	•••••
Z	•••••	•••••	•••••
1	•••••	•••••	•••••
2	•••••	•••••	•••••
3	•••••	•••••	•••••
4	•••••	•••••	•••••
5	•••••	•••••	•••••
6	•••••	•••••	•••••
7	•••••	•••••	•••••
8	•••••	•••••	•••••
9	•••••	•••••	•••••
0	•••••	•••••	•••••
0 (air)	•••••	•••••	•••••

Early Morse Signals

# GMDSS History

Second Radio Officer, and in the logs of the SS Carpathia, Titanic first used "CQD" to call for help. When Captain Smith gave the order to radio for help, first radio officer Jack Phillips sent "CQD" six times followed by the Titanic call letters, "MGY."



Vibroplex key of 1910

# GMDSS History

There is much mystery and misinformation surrounding the origin and use of maritime distress calls. Most of the general populace believes that "SOS" signifies "Save Our Ship." Casual students of radio history are aware that the use of "SOS" was preceded by "CQD." Why were these signals adopted? When were they used?

The practical use of wireless telegraphy was made possible by **Guglielmo Marconi** in the closing years of the 19th century. Until then, ships at sea out of visual range were very much isolated from shore and other ships. The wireless telegraphers used Morse Code to send messages. Morse Code is a way of "tapping" out letters using a series of dots (short signals) and dashes (long signals). Spoken, short signals are referred to as "dih" and long signals are referred to as "dah". The letter "A" is represented by a dot followed by a dash:

🔊🔊 ■■■■■ = A



**Guglielmo Marconi**

# GMDSS History

The Marconi Yearbook of Wireless Telegraphy and Telephony, 1918 states, "This signal [SOS] was adopted simply on account of its easy radiation and its unmistakable character. There is no special signification in the letter themselves, and it is entirely incorrect to put full stops between them [the letters]." All the popular interpretations of "SOS," "Save Our Ship," "Save Our Souls," or "Send Out Succour" are simply not valid. Stations hearing this distress call were to immediately cease handling traffic until the emergency was over and were likewise bound to answer the distress signal.

Although the use of "SOS" was officially ratified in 1908, the use of "CQD" lingered for several more years, especially in British service where it originated.

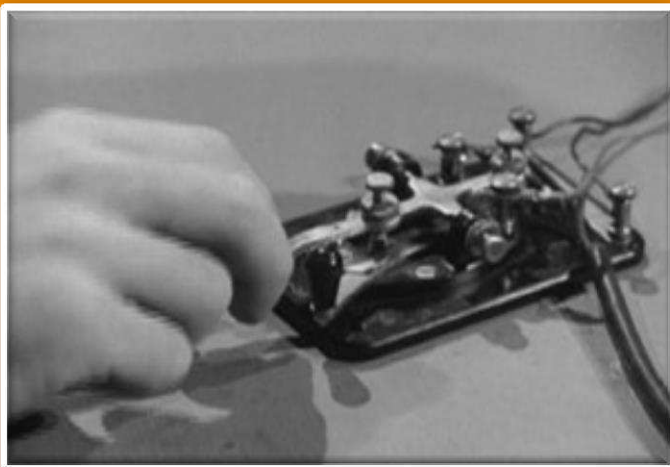




# GMDSS History

In 1904, the Marconi company suggested the use of "CQD" for a distress signal. Although generally accepted to mean, "Come Quick Danger," that is not the case. It is a general call, "CQ," followed by "D," meaning distress. A strict interpretation would be "All stations, Distress."

At the second Berlin Radiotelegraphic Conference 1906, the subject of a danger signal was again addressed. Considerable discussion ensued and finally SOS was adopted. The thinking was that three dots, three dashes and three dots could not be misinterpreted. It was to be sent together as one string.



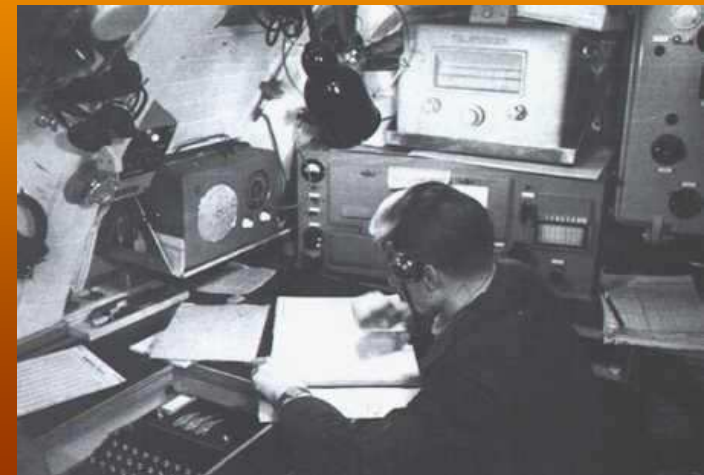
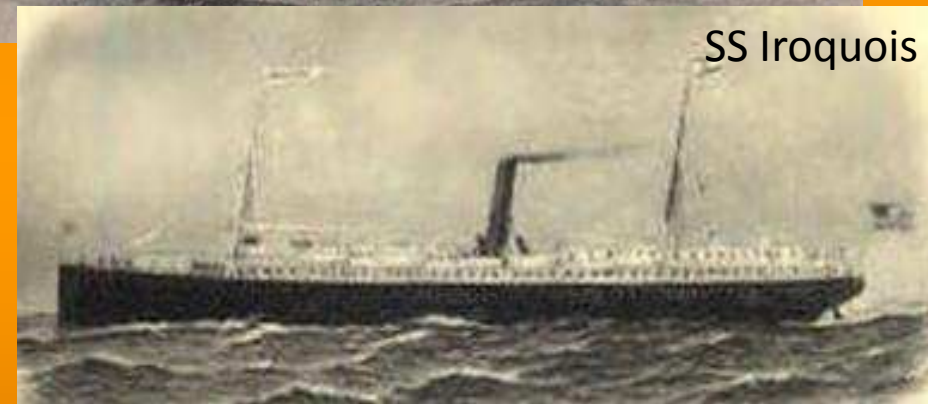
# GMDSS History

By 1904 there were many trans-Atlantic British ships equipped with wireless communications. The wireless operators came from the ranks of railroad and postal telegraphers. In England a general call on the landline wire was a "CQ." "CQ" preceded time signals and special notices. "CQ" was generally adopted by telegraph and cable stations all over the world. By using "CQ," each station receives a message from a single transmission and an economy of time and labor was realized. Naturally, "CQ," went with the operators to sea and was likewise used for a general call. This sign for "all stations" was adopted soon after wireless came into being by both ships and shore stations.



# GMDSS History

The first recorded American use of "SOS" was in August of 1909. Wireless operator T. D. Haubner of the SS Arapahoe radioed for help when his ship lost its screw near Diamond Shoals, sometimes called the "Graveyard of the Atlantic." The call was heard by the United Wireless station "HA" at Hatteras. A few months later, the SS Arapahoe received an "SOS" distress call from the SS Iroquois. Radio Officer Haubner therefore has the distinction of being involved in the first two incidents of the use of "SOS" in America, the first as the sender and the second as the receiver. The U.S. did not officially adopt "SOS" until 1912, being slow to adopt international wireless standards



# GMDSS History

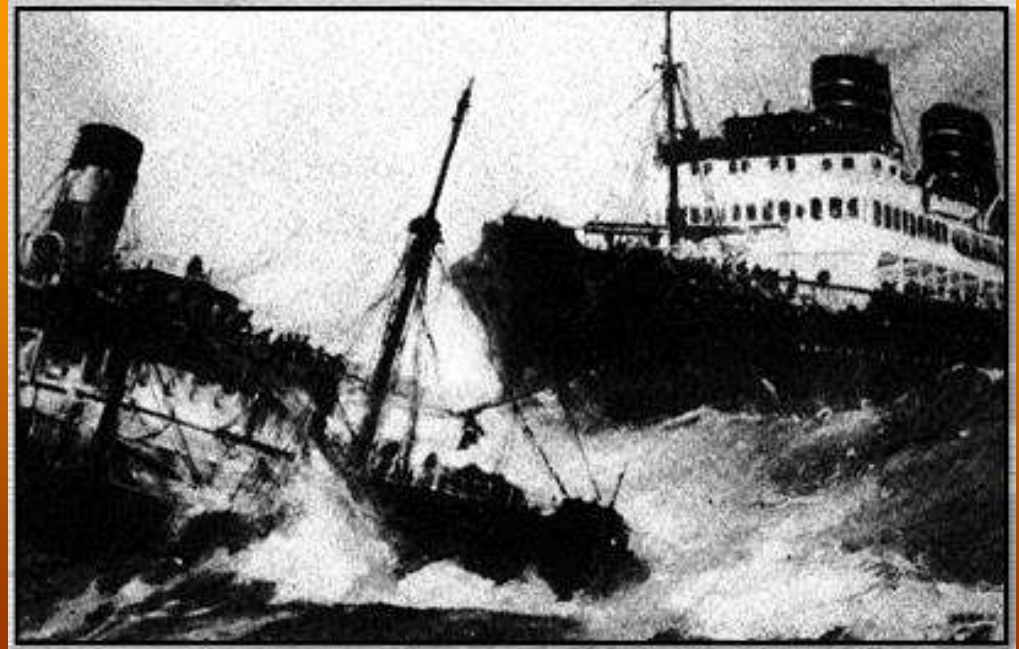
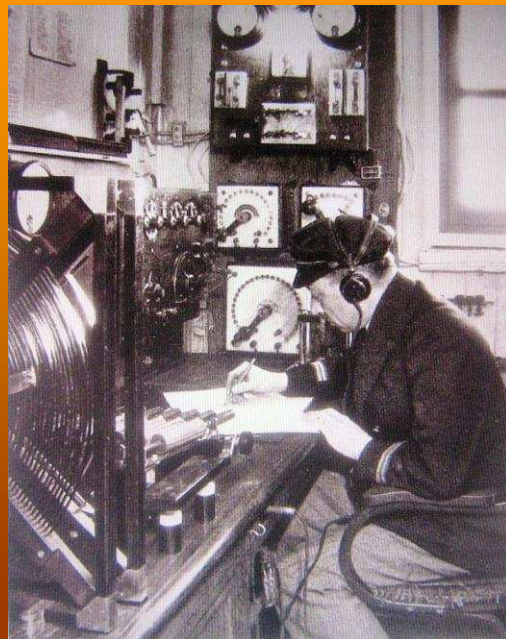
The United States congress enacted legislation soon after, requiring U.S. ships to use Morse code radiotelegraph equipment for distress calls. The INTERNATIONAL TELECOMMUNICATIONS UNION (ITU), now a United Nations agency, followed suit for ships of all nations. Morse encoded distress calling has saved thousands of lives since its inception almost a century ago, but its use requires skilled radio operators spending many hours listening to the radio distress frequency. Its range on the Medium Frequency (MF) distress band (500 kHz) is limited, and the amount of traffic Morse signals can carry is also limited.



# GMDSS History

Not all ship-to-shore radio communications were short range. Some radio stations provided long-range radiotelephony services, such as radio telegrams and radio telex calls, on the HIGH FREQUENCY (HF) bands (3-30 MHz) enabling worldwide communications with ships.

For example, Portishead radio, which was the world's busiest radiotelephony station, provided HF long-range services. In 1974, it had 154 radio operators who handled over 20 million words per year. Such large radiotelephony stations employed large numbers of people and were expensive to operate. By the end of the 1980s, satellite services had started to take an increasingly large share of the market for ship-to-shore communications



# GMDSS History

It spelled the end of Morse code communications for all but a few users, such as Amateur Radio Operators. The GMDSS provides for automatic distress alerting and locating in cases where a radio operator doesn't have time to send an **SOS** or **MAYDAY** call, and, for the first time, requires ships to receive broadcasts of maritime safety information which could prevent a distress from happening in the first place. In 1988, IMO amended the Safety of Life at Sea (SOLAS) Convention, requiring ships subject to it fit GMDSS equipment.

Such ships were required to carry NAVTEX and satellite EPIRBs by 1 August 1993, and had to fit all other GMDSS equipment by 1 February 1999. US ships were allowed to fit GMDSS in lieu of Morse telegraphy equipment by the

**Telecommunications Act of 1996**

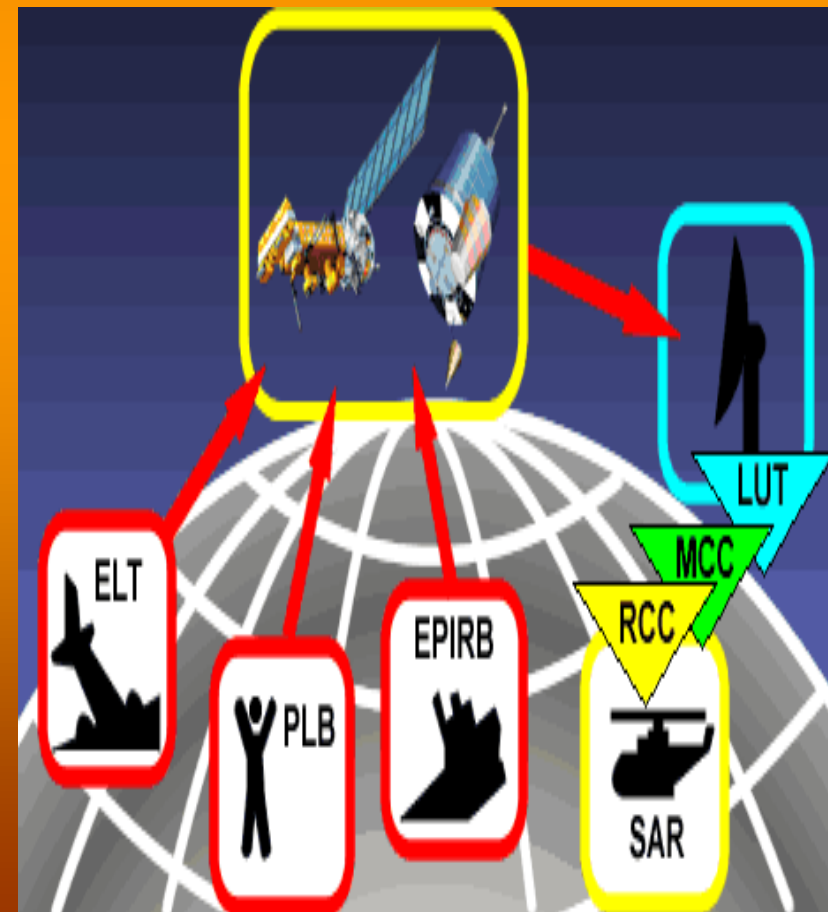


# GMDSS History

For these reasons, the INTERNATIONAL MARITIME ORGANIZATION (IMO), a United Nations agency specializing in safety of shipping and preventing ships from polluting the seas, began looking at ways of improving maritime distress and safety communications. In 1979, a group of experts drafted the International Convention on Maritime Search and Rescue, which called for development of a global search and rescue plan.

This group also passed a resolution calling for development by IMO of a Global Maritime Distress and Safety System (GMDSS) to provide the communication support needed to implement the search and rescue plan.

This new system, which the world's maritime nations are implementing, is based upon a combination of Satellites and terrestrial radio services, and has changed international distress communications from being primarily ship-to-ship based to ship-to-shore (Rescue Coordination Center)based.

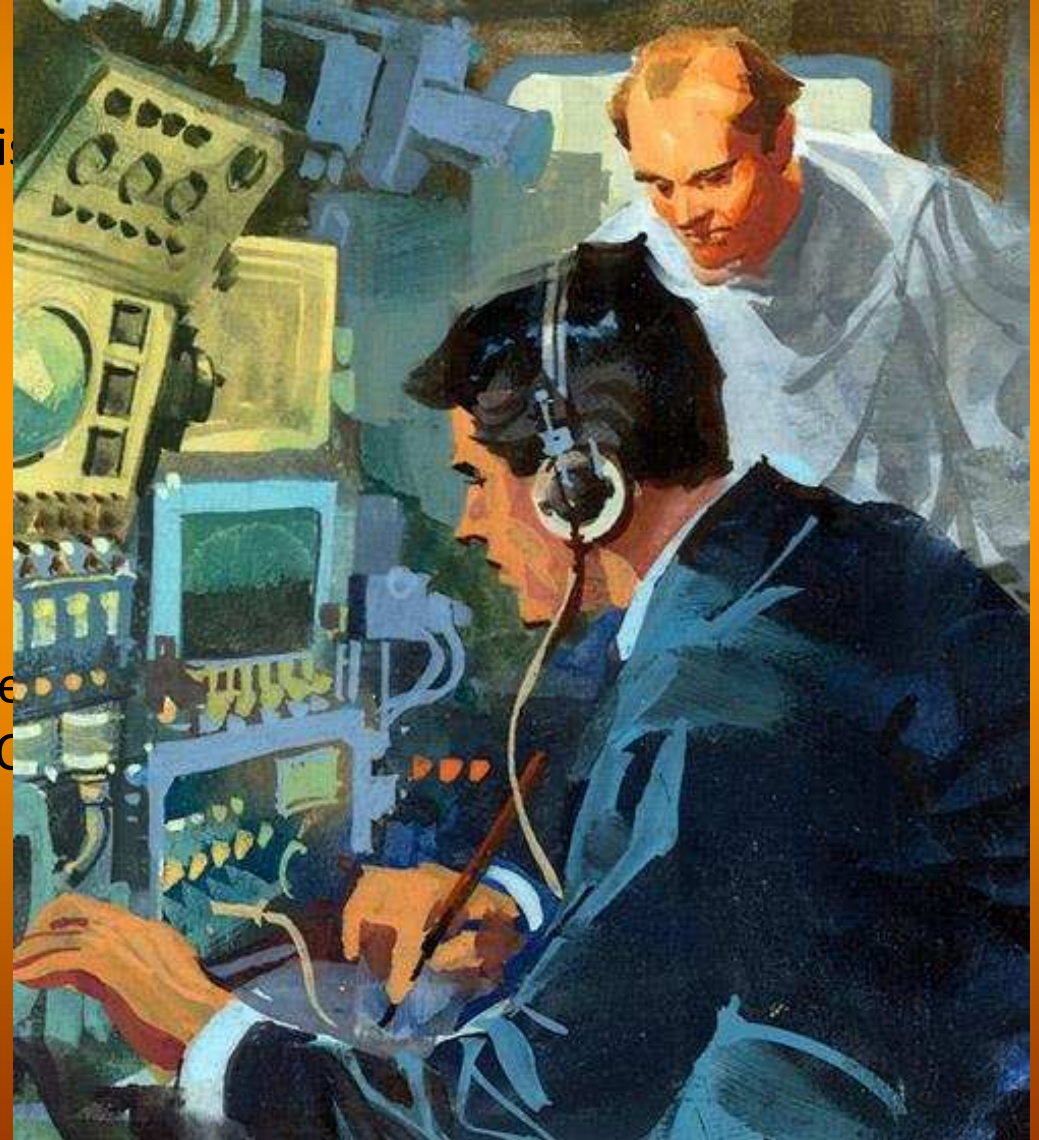


# GMDSS Licensing of Operators

National maritime authorities may issue various classes of licenses. The General Operator's Certificate is required on SOLAS vessels operating also outside GMDSS Sea Area A1, while a Restricted Operator's Certificate is needed on SOLAS vessels operated solely within GMDSS Sea Area A1,

Long Range Certificate may be issued, and is required on non-SOLAS vessels operating outside GMDSS Sea Area A1, while a Short Range Certificate is issued for non-SOLAS vessels operating only inside GMDSS Sea Area A1.

Finally there is a Restricted radiotelephone operator's certificate, which is similar to the Short Range Certificate but limited VHF DSC radio operation. Some countries do not consider this adequate for GMDSS qualification.





# GMDSS Licensing of Operators

---

In the United States four different GMDSS certificates are issued. A GMDSS Radio Maintainer's License allows a person to maintain, install, and repair GMDSS equipment at sea. A GMDSS Radio Operator's License is necessary for a person to use required GMDSS equipment. The holder of both certificates can be issued one GMDSS Radio Operator/Maintainer License. Finally, the **GMDSS Restricted License** is available for VHF operations only within 20 nautical miles (37 km) of the coast. To obtain any of these licenses a person must be a U.S. citizen or otherwise eligible for work in the country, be able to communicate in English, and take written examinations approved by the Federal Communications Commission. Like the Amateur Radio examinations, these are given by private, FCC-approved groups. These are generally not the same agencies who administer the ham tests. Written test elements 1 and 7 are required for the Operator license, and elements 1 and 7R for the Restricted Operator. (Passing element 1 also automatically qualifies the applicant for the Marine Radiotelephone Operator Permit, the MROP.)

# GMDSS Licensing of Operators

For the Maintainer license, written exam element 9 must be passed. However, to obtain this certificate an applicant must also hold a **General radiotelephone License (GROL)**, which requires passing commercial written exam elements 1 and 3 (and thus supersedes the MROP). Upon the further passing of optional written exam element 8 the ship radar endorsement will be added to both the GROL and Maintainer licenses. This allows the holder to adjust, maintain, and repair shipboard Radar equipment.

Until March 25, 2008 GMDSS operator and maintainer licenses expired after five years but could be renewed upon payment of a fee. On that date all new certificates were issued valid for the lifetimes of their holders. For those still valid but previously issued with expiration dates, the FCC states:

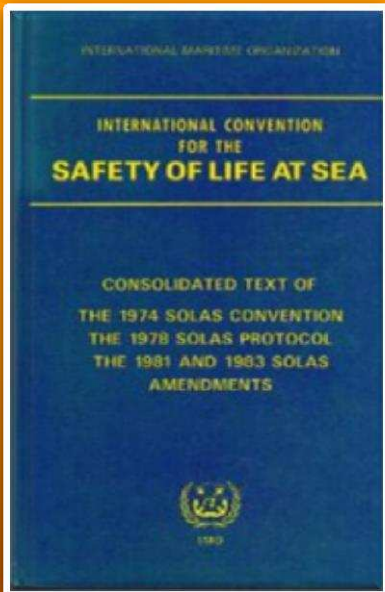
Any GMDSS Radio Operator's License, Restricted GMDSS Radio Operator's License, GMDSS Radio Maintainer's License, GMDSS Radio Operator/Maintainer License, or Marine Radio Operator Permit that was active, i.e., had not expired, as of March 25, 2008, does not have to be renewed.

Since an older certificate does show an expiration date, for crewmembers sailing internationally it may be worth paying the fee (as of 2010 it was \$60) to avoid any confusion with local authorities.

Finally, to actually serve as a GMDSS operator on most commercial vessels the **United states Coast Guard** requires additional classroom training and practical experience beyond just holding a license

# GMDSS Background

The GMDSS was adopted by amendments in 1988 by the Conference of Contracting Governments to the International Convention for the Safety of Life at Sea (SOLAS), 1974. This was the culmination of more than a decade of work by the International Maritime Organization (IMO) in conjunction with the International Telecommunications Union (ITU), International Hydrographic Organization (IHO), World Meteorological Organization (WMO), International Maritime Satellite Organization (INMARSAT), and others communications.



# GMDSS

The Global Maritime Distress and Safety System (GMDSS) is an internationally agreed-upon set of safety procedures, types of equipment, and communication protocols used to increase safety and make it easier to rescue distressed ships, boats and aircraft.

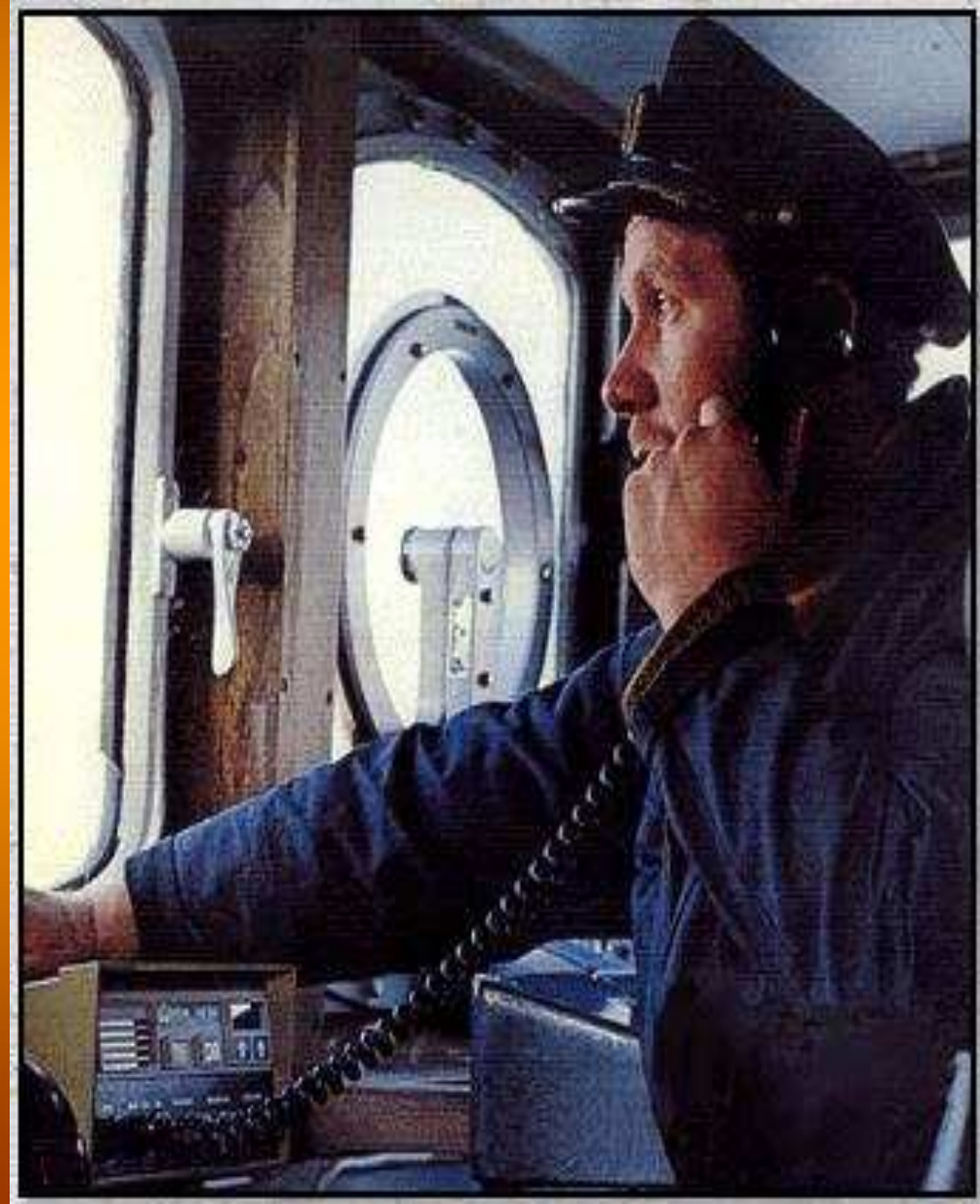
GMDSS these limitations by introducing modern communication technology, including satellites and digital selective calling techniques to transmit and receive distress alerts automatically over long ranges reliably.



# GMDSS Concept

All ships must perform 9 specific functions irrespective of where they are at sea:

1. Ship-to-shore distress alerting.
2. Shore-to-ship distress alerting.
3. Ship-to-ship distress alerting.
4. SAR coordination.
5. On-scene communications.
6. Transmission and receipt of emergency locating signals.
7. Transmission and receipt of MSI.
8. General radio communications.
9. Bridge-to-bridge communications.



# GMDSS 9 Important Functions

SHIP to SHORE:

All ships shall be able to send or transmit alert DISTRESS by ship to shore communication in at least two independent ways.

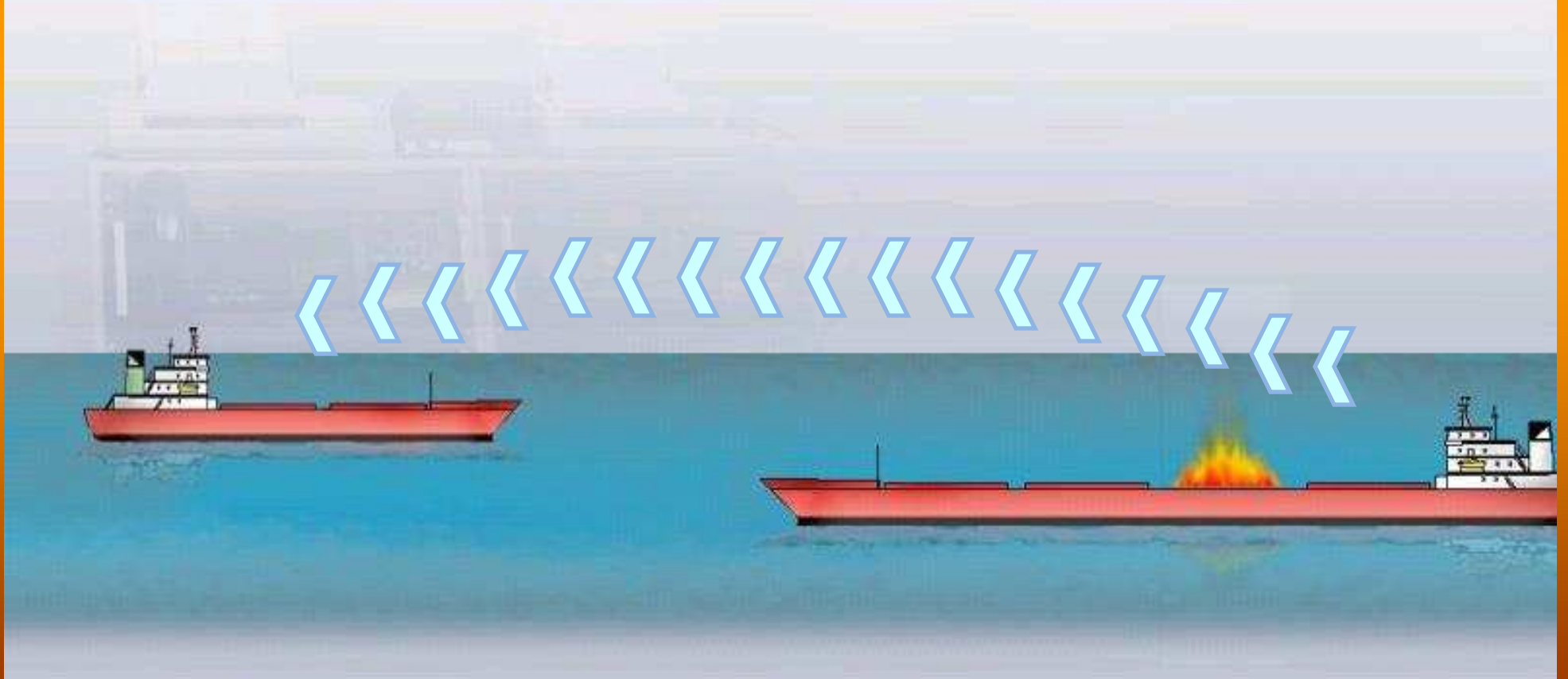
- Ship's Identification
- Ship's Position
- Time the position is valid
- Nature of Distress



# GMDSS 9 Important Functions

SHIP to SHIP:

All ships shall be able to send or transmit alert DISTRESS by ship to ship communication using Digital Selective Calling (DSC) for all stations also sends Distress Alerts in the VHF, MF and HF bands.

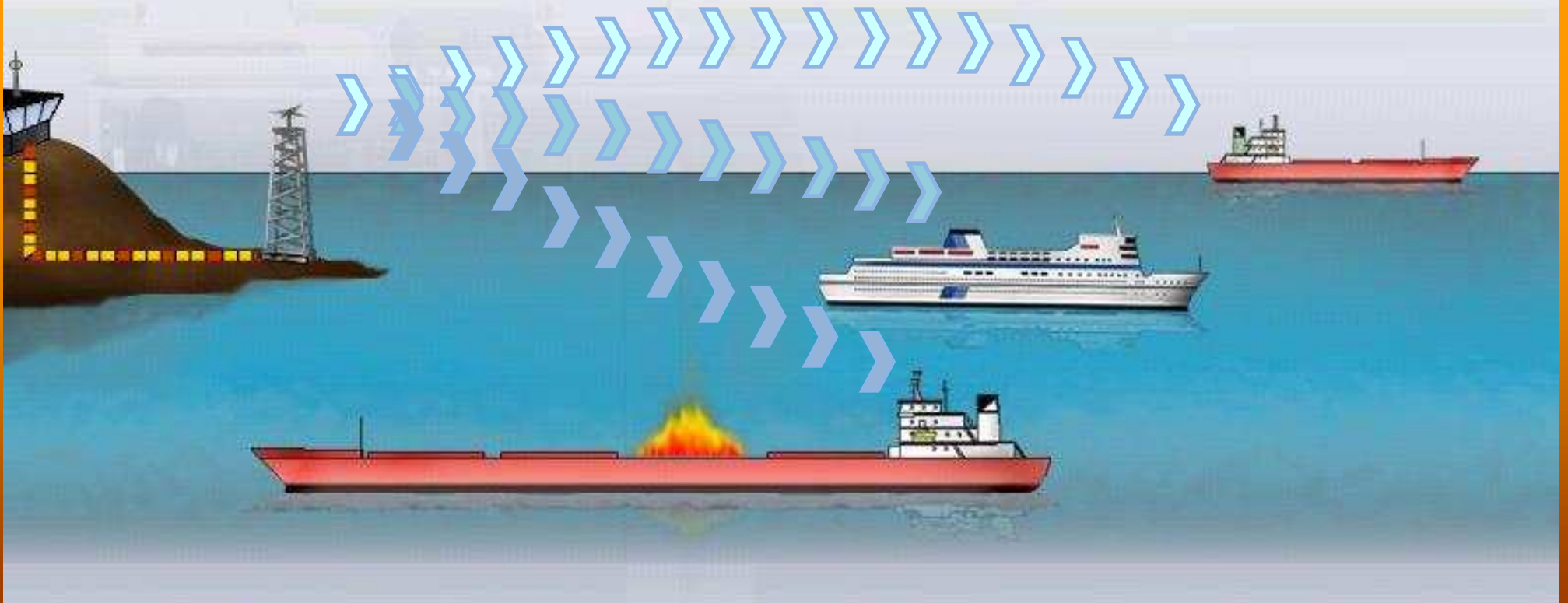


# GMDSS 9 Important Functions

SHORE to SHIP:

A Rescue Coordinating Center (RCC) or Coast Radio Station (CRS) acknowledges the DISTRESS alerts and sending it to all ships.

If it is necessary, the RCC or CRS relays the DISTRESS alerts to all Ships in the vicinity.



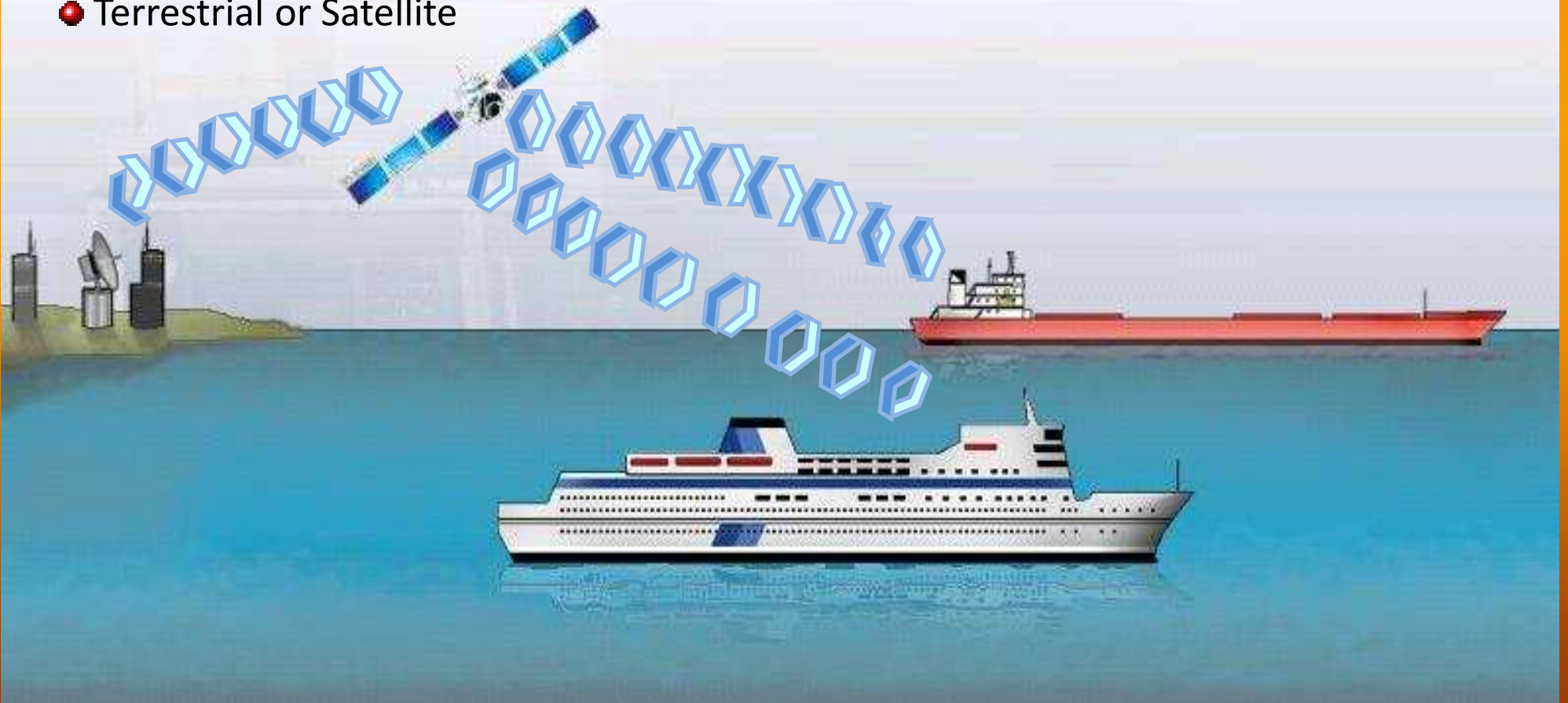


# GMDSS 9 Important Functions

## SEARCH and RESCUE Communication

Are those necessary for the RCC to coordinate and control the communication in search and rescue operation. With the following methods of communications.

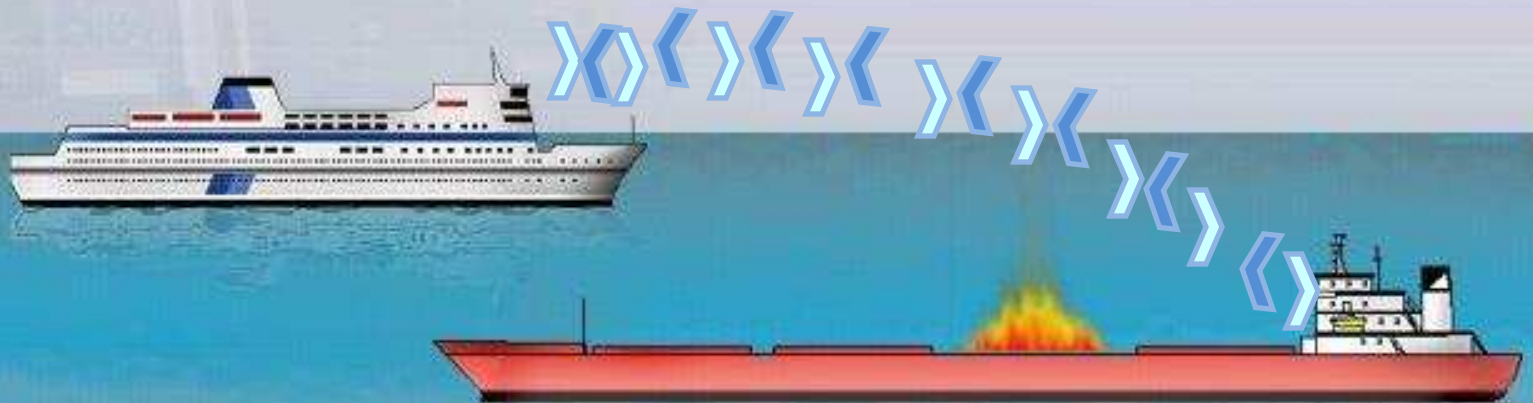
- Telephony and Telex
- Terrestrial or Satellite



# GMDSS 9 Important Functions

## ON-SCENE Communication

Are normally on short range VHF and MF bands the frequency designated for safety and Distress communications. This is vital for the operation of ships in distress and for the rescue of survivors.



# GMDSS 9 Important Functions

## LOCATING

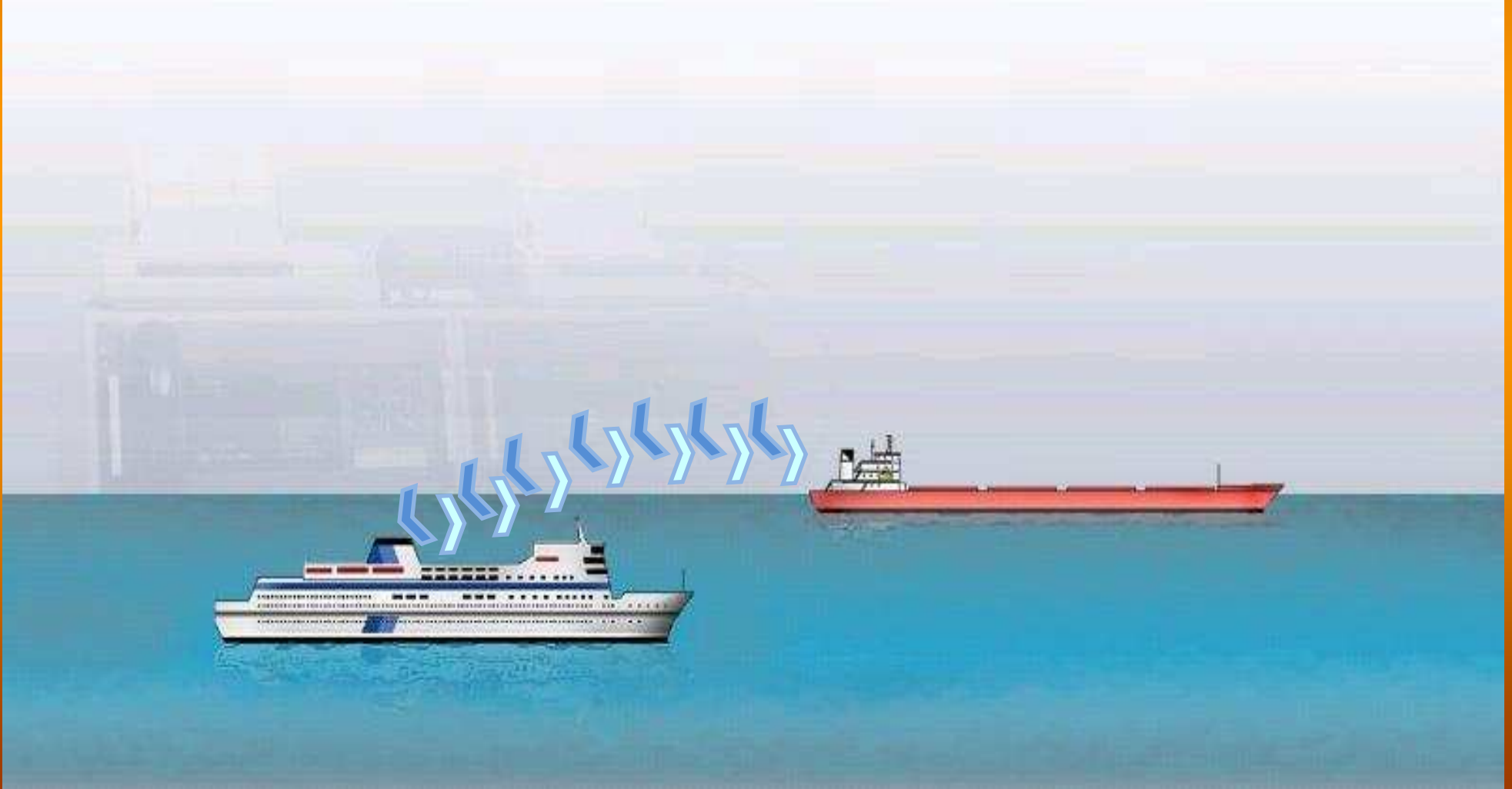
Is the finding of the Ship in distress or survivors. In GMDSS this means finding the Search And Rescue Transponder (SART). The SART signal can be identified as 12 dot Racon echoes on a the screen of a 3cm radar.



# GMDSS 9 Important Functions

## BRIDGE to BRIDGE Communication

Means a safety communication between ships. Channel 13 is reserved for short range communication safety of navigation and maneuvering traffic on VHF radio telephone.



# GMDSS 9 Important Functions

GMDSS ship beyond NAVTEX coverage shall receive MSI via:

- HF Radio Telex – World-wide Navigational Warning System (WWNWS)
- INMARSAT – ECG Safety NET



Sample of NAVTEX MSI message

```
ZCZC HB38  
071930 UTC JUN  
GERMAN GALE WARNING 218
```

```
RISK OF STRONG SOUTH-WEST TO  
WEST TO WESTERLY WIND  
FORCCE 6 AT TIME* IN  
WESTERN AND SOUTHERN  
BALTIC...
```

```
NNNN
```

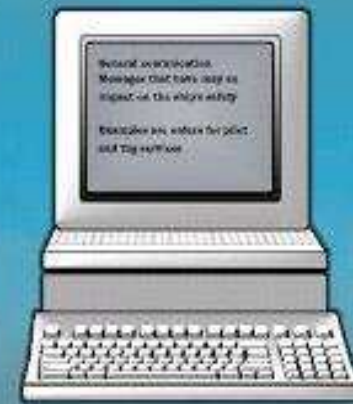
## MARINE SAFETY INFORMATION (MSI)

MSI Broadcast includes navigational warnings meteorological warnings and forecast and other urgent safety information, ships with in the range of radio coast stations receive information through NAVTEX on 518 kHz, beyond coastal waters ships receive MSI information through satellite Safety NET service using the INMARSAT Enhanced Group Call (EGC) or by HF radio telex.

# GMDSS 9 Important Functions

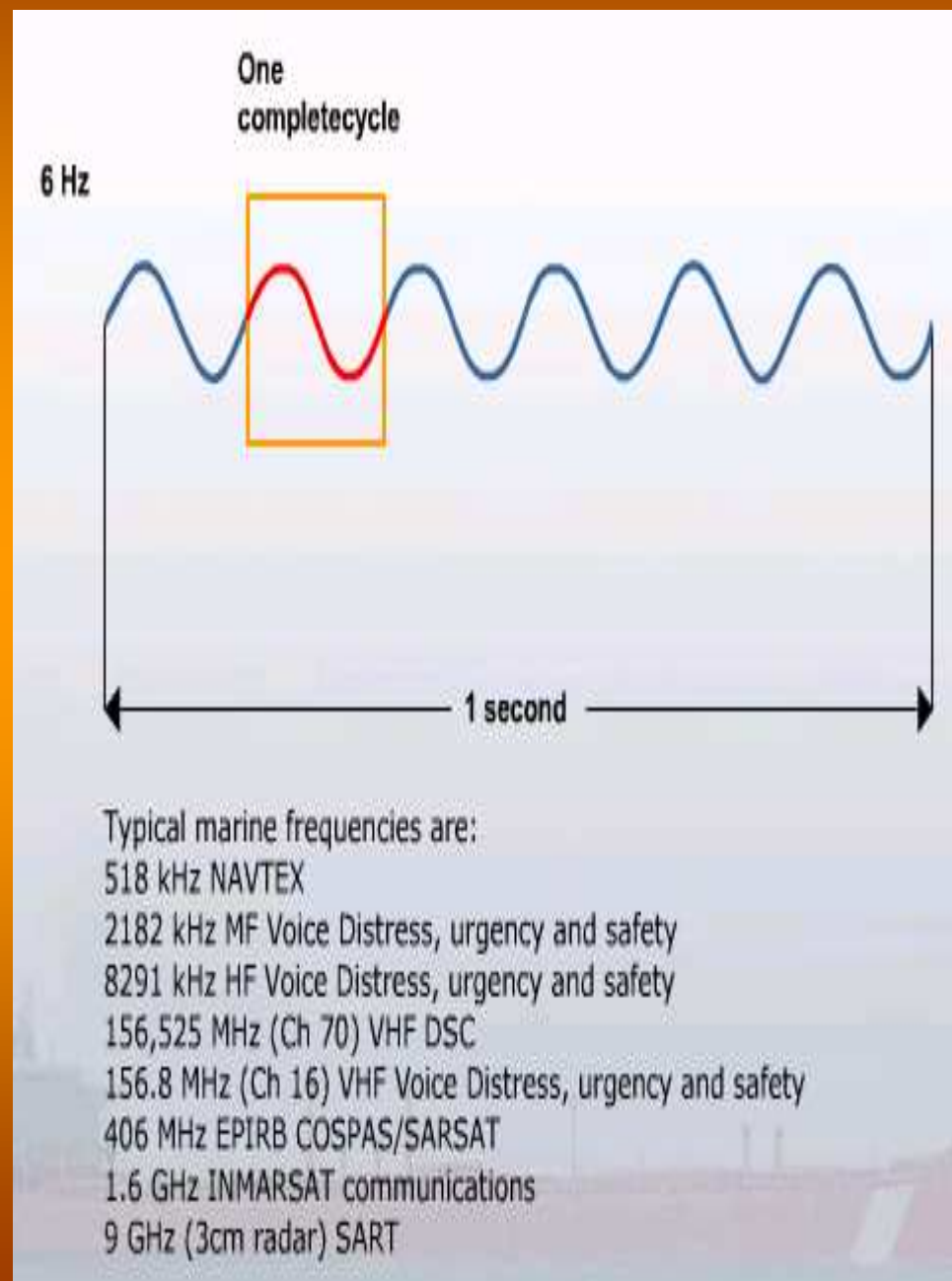
## General Communication

According to GMDSS are ship to shore communication other than safety, urgency and distress messages that may have an impact on the ships safety. It is also encourage to in routine communications



# GMDSS Basics

**Radio waves** are a type of electromagnetic radiation with wavelengths in the electromagnetic spectrum longer than infrared light. Radio waves have frequencies from 300 GHz to as low as 3 kHz, and corresponding wavelengths from 1 millimeter to 100 kilometers. Like all other electromagnetic waves, they travel at the speed of light. Naturally occurring radio waves are made by lightning, or by astronomical objects. Artificially generated radio waves are used for fixed and mobile radio communication, broadcasting, radar and other navigation systems, communications satellites, computer networks and innumerable other applications. Different frequencies of radio waves have different propagation characteristics in the Earth's atmosphere; long waves may cover a part of the Earth very consistently, shorter waves can reflect off the ionosphere and travel around the world, and much shorter wavelengths bend or reflect very little and travel on a line of sight.



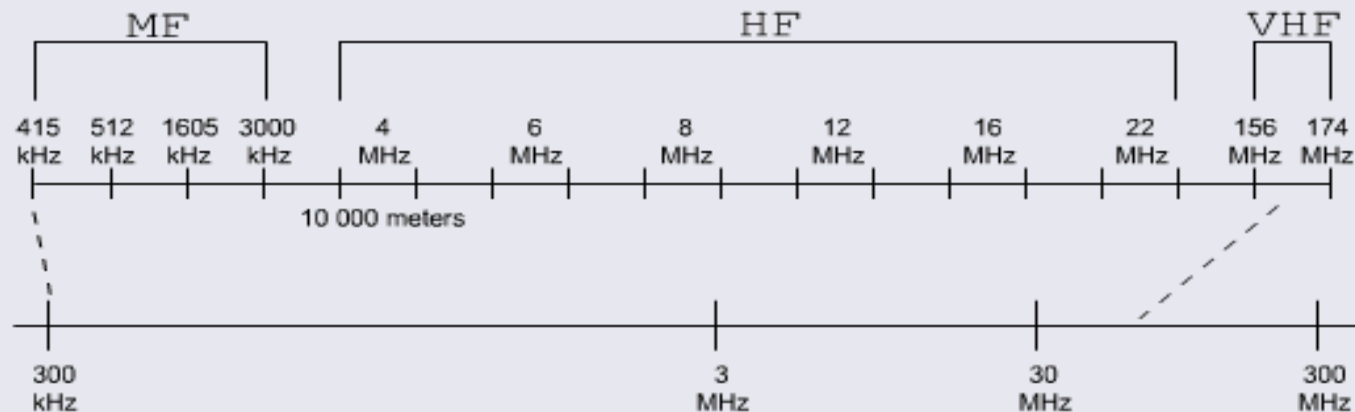
# GMDSS Basics

The frequencies falling between three kilohertz to three hundred gigahertz are called radio frequencies since they are commonly used in radio communications.

Radio frequencies spectrum is divided into eight frequency bands namely Very low frequency, Low frequency, Medium frequency, High frequency, Very high frequency, Ultra high frequency, Super high frequency and Extreme high frequency. Each of these frequencies is ten times higher in frequency as the one immediately below it.

The term hertz was designated for use in lieu of the term cycles per second when referring to the frequency of radio waves. Hertz refer to the number of occurrences that take place in one second.

**Note! Maritime Services only use parts of the Radio frequency spectrums as illustrated below.**



## Typical marine frequencies are:

- 518 kHz Navtex
- 2182 kHz MF Voice Distress, Urgency and Safety
- 2187.5 kHz DSC frequency
- 156.8 MHz VHF channel 16 Voice Frequency.



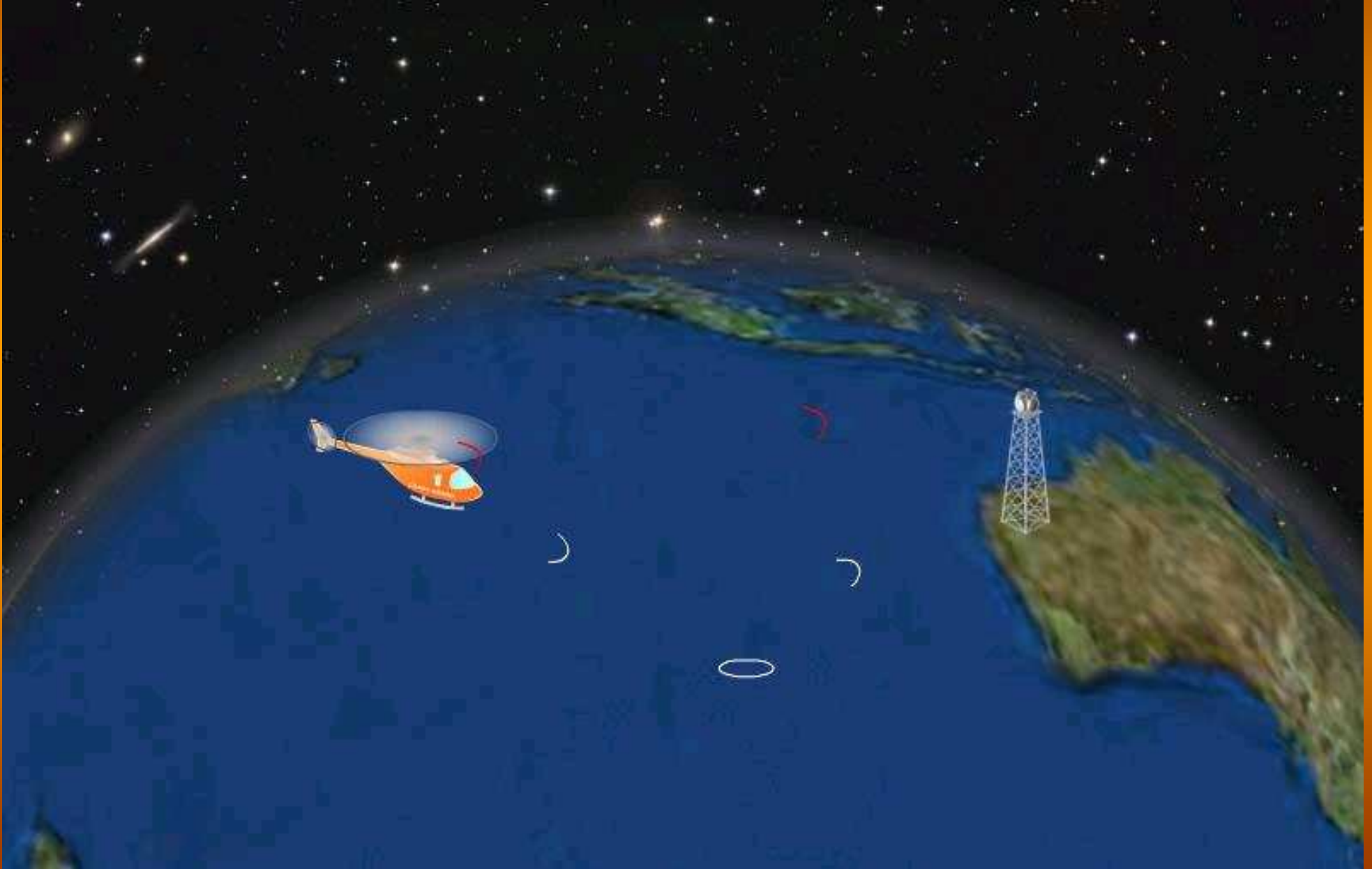
# Basics Radio Waves

Radio waves can be transmitted from one point to another by sky wave, ground waves, direct waves and reflective waves, and HF radio waves radiated into space by an HF antenna are refracted on the ionosphere and back to the earth's surface.

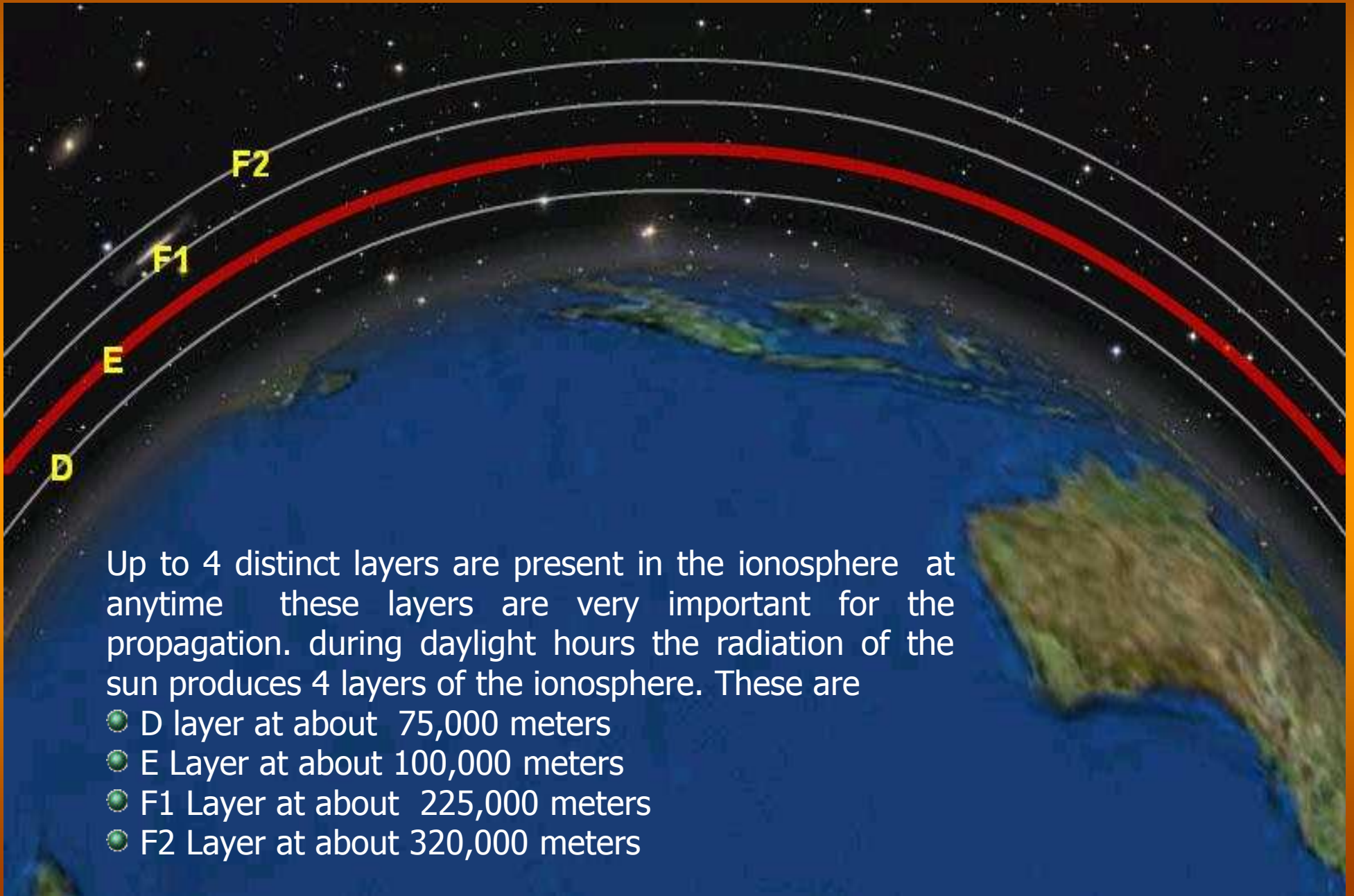


# Basics Radio Waves

Direct and refracted radio waves are typical example of VHF radio waves



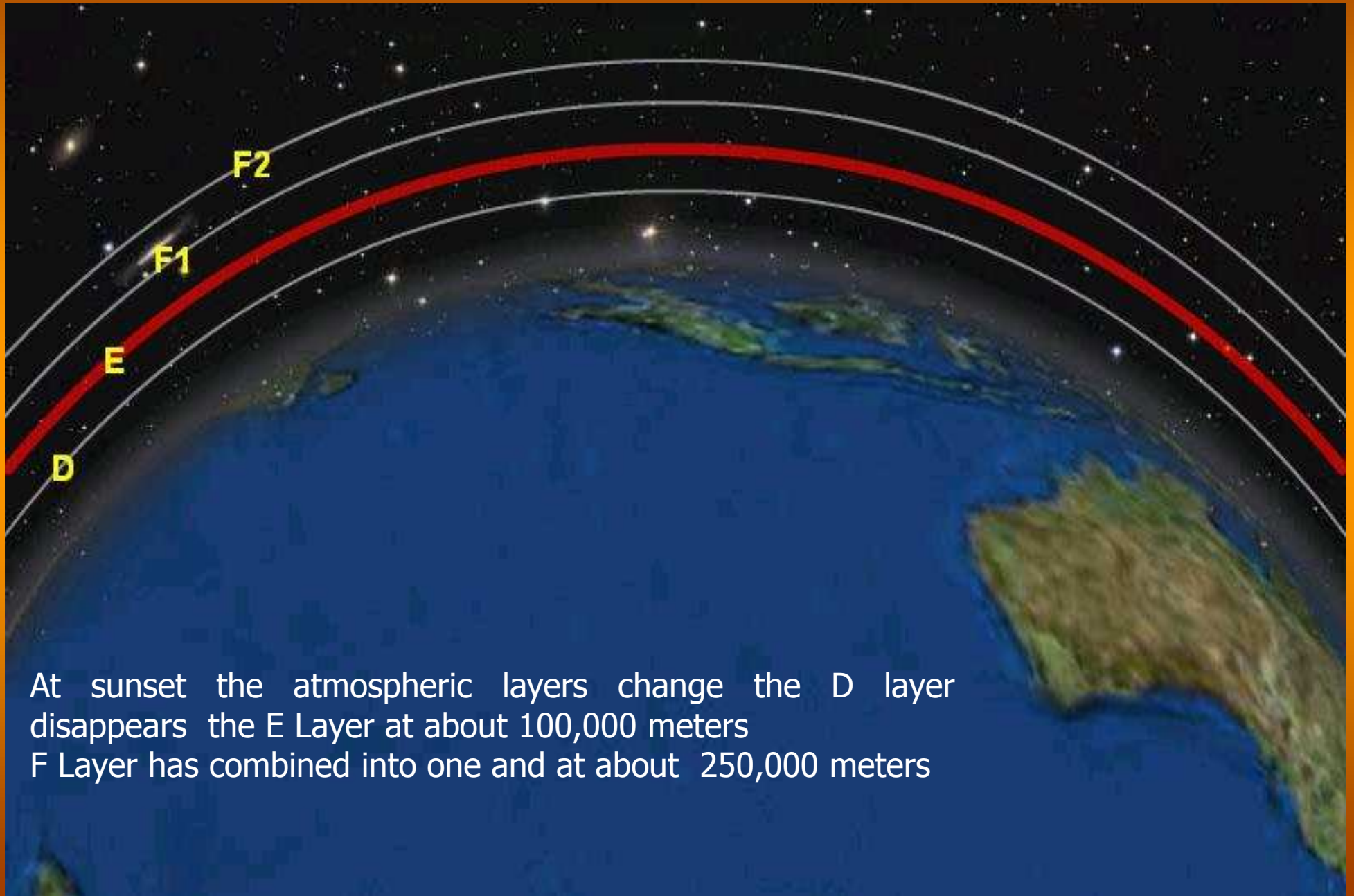
# Basics Atmospheric Layers



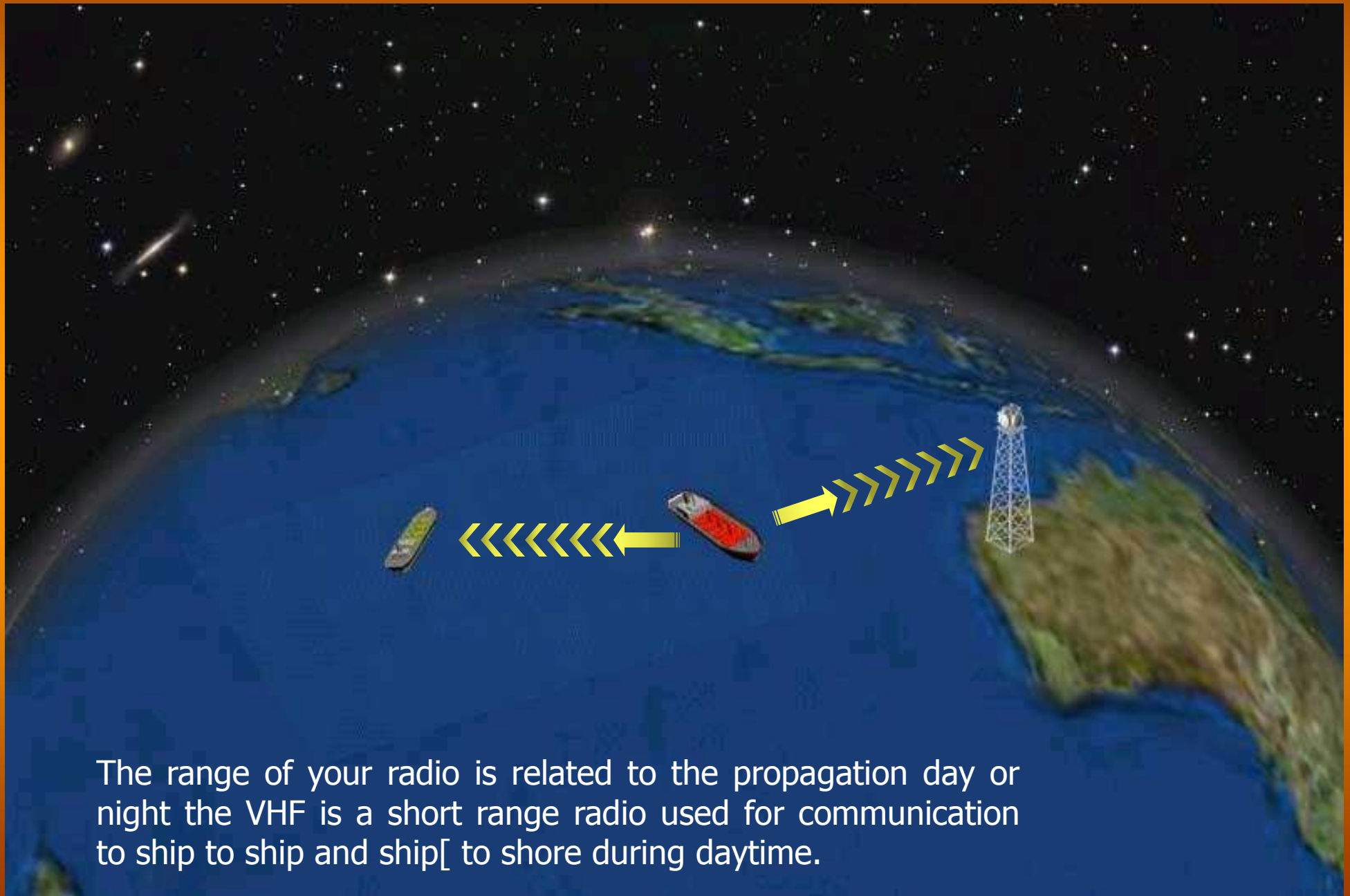
Up to 4 distinct layers are present in the ionosphere at anytime these layers are very important for the propagation. during daylight hours the radiation of the sun produces 4 layers of the ionosphere. These are

- D layer at about 75,000 meters
- E Layer at about 100,000 meters
- F1 Layer at about 225,000 meters
- F2 Layer at about 320,000 meters

# Basics Atmospheric Layers



# Basics Propagation VHF day time



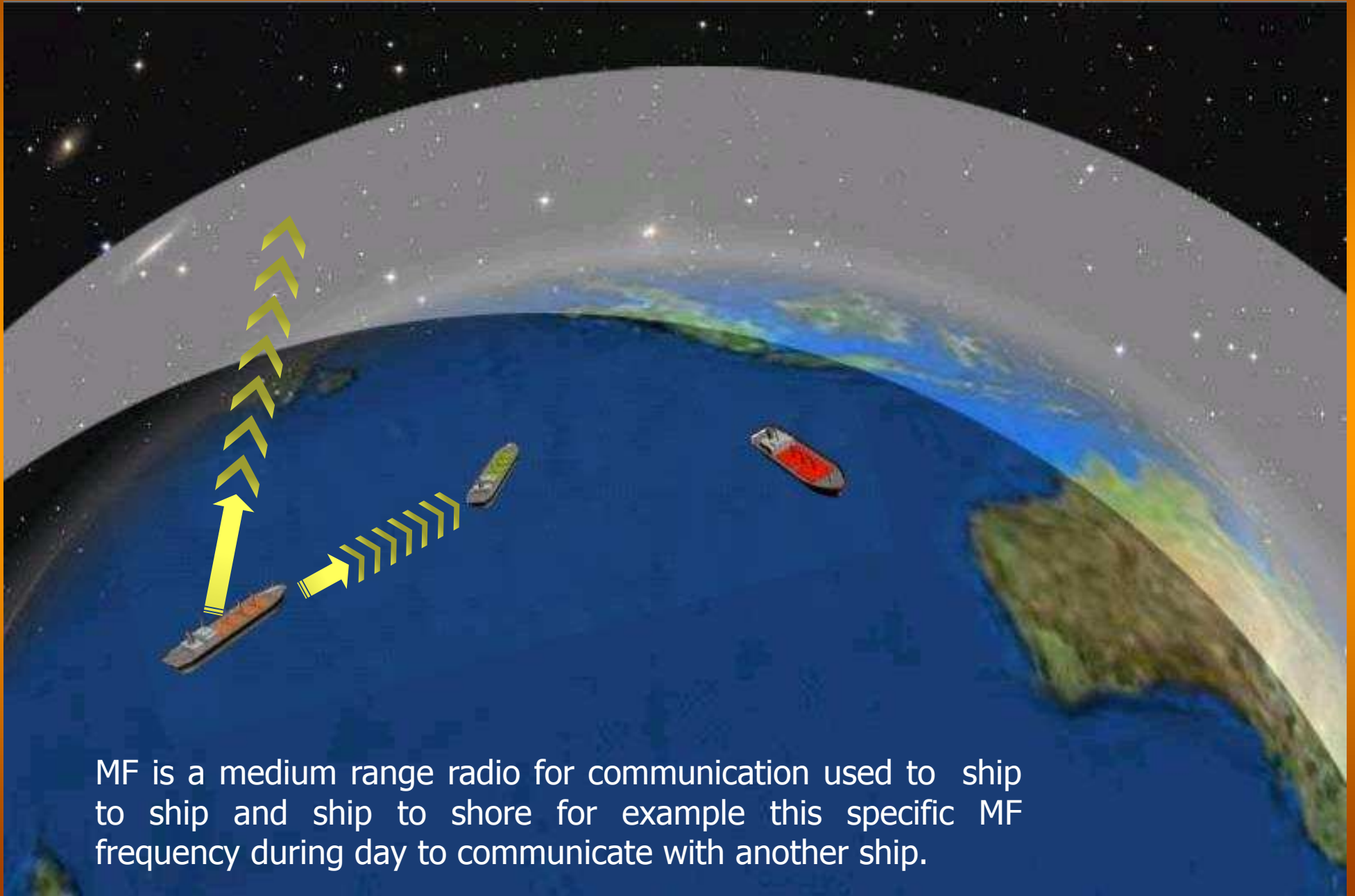
The range of your radio is related to the propagation day or night the VHF is a short range radio used for communication to ship to ship and ship[ to shore during daytime.

# Basics Propagation VHF Night time



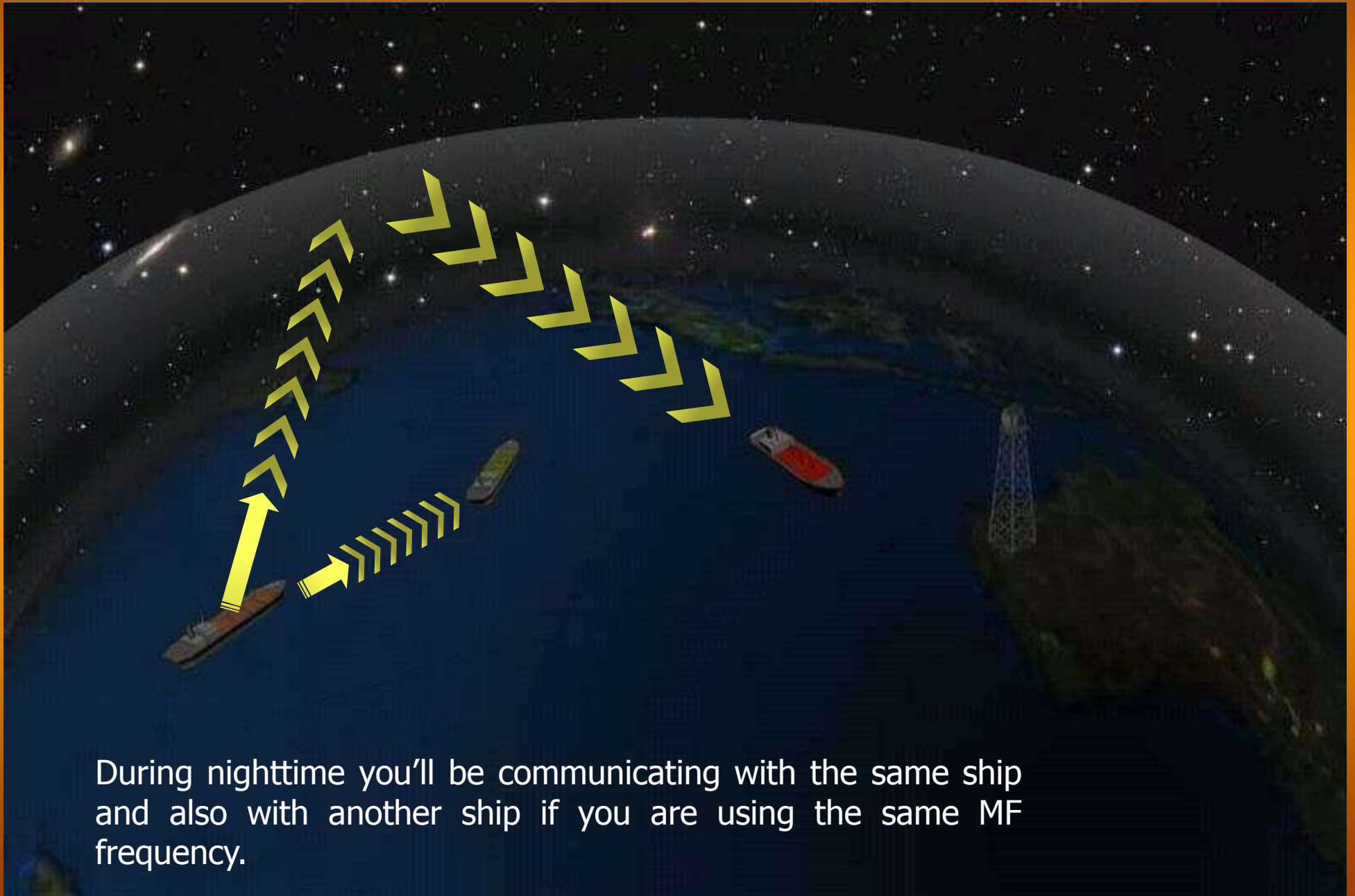
At nighttime use the same frequencies and VHF Channel.

# Basics Propagation MF Day time



MF is a medium range radio for communication used to ship to ship and ship to shore for example this specific MF frequency during day to communicate with another ship.

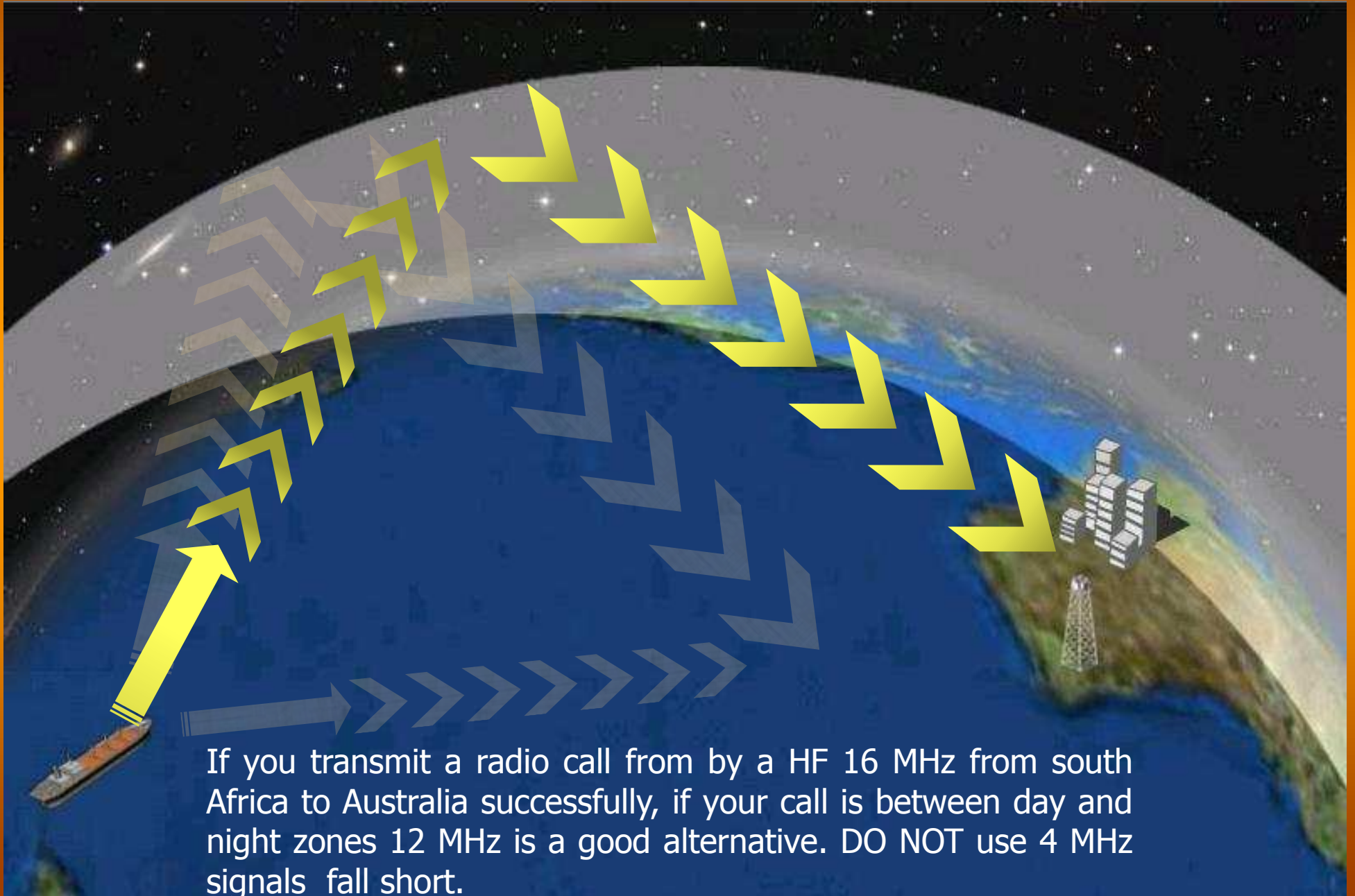
# Basics Propagations MF night time



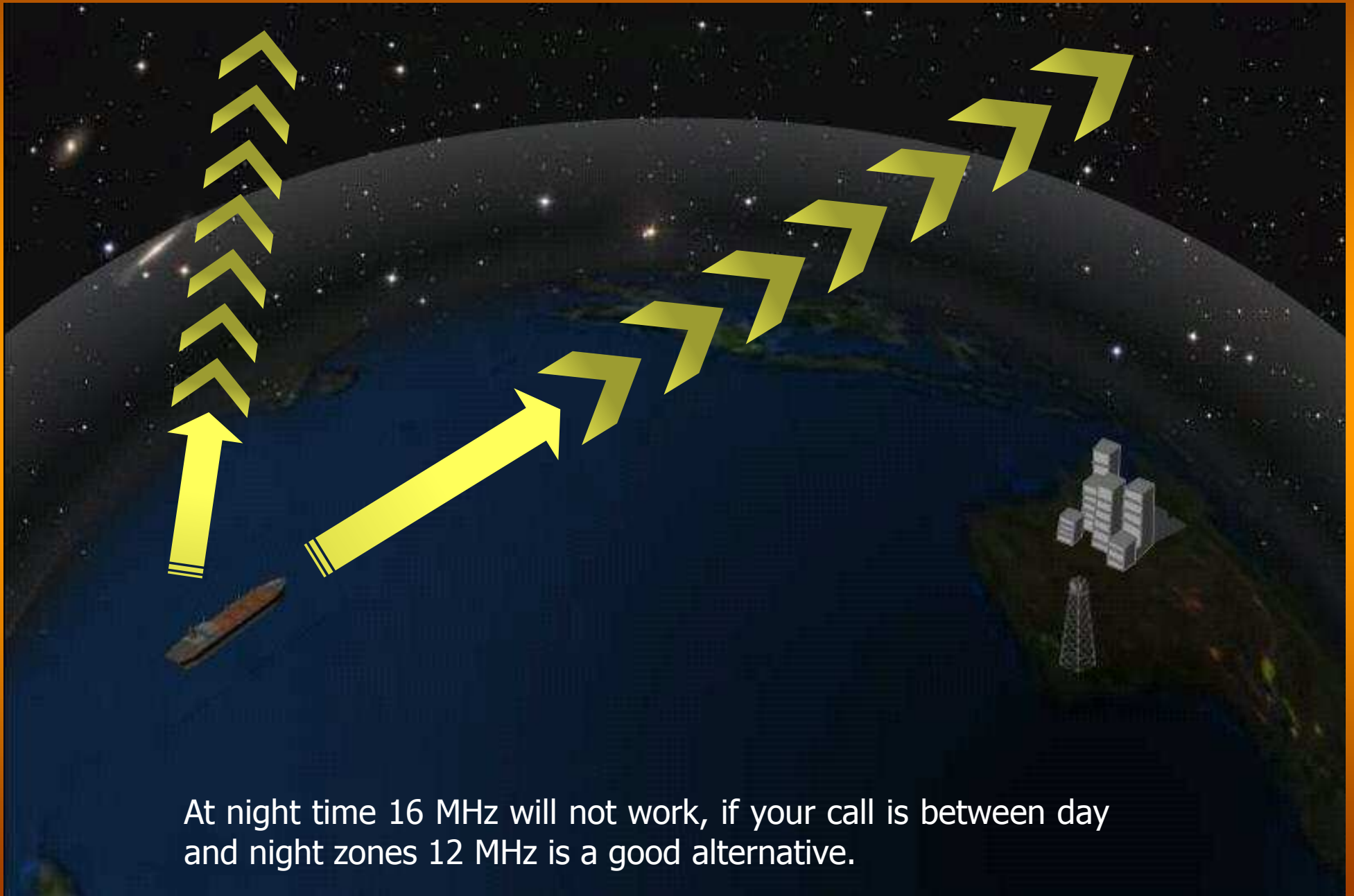
During nighttime you'll be communicating with the same ship and also with another ship if you are using the same MF frequency.



# Basics Propagations HF Day time 16 MHz



# Basics Propagations HF Night time 16 MHz



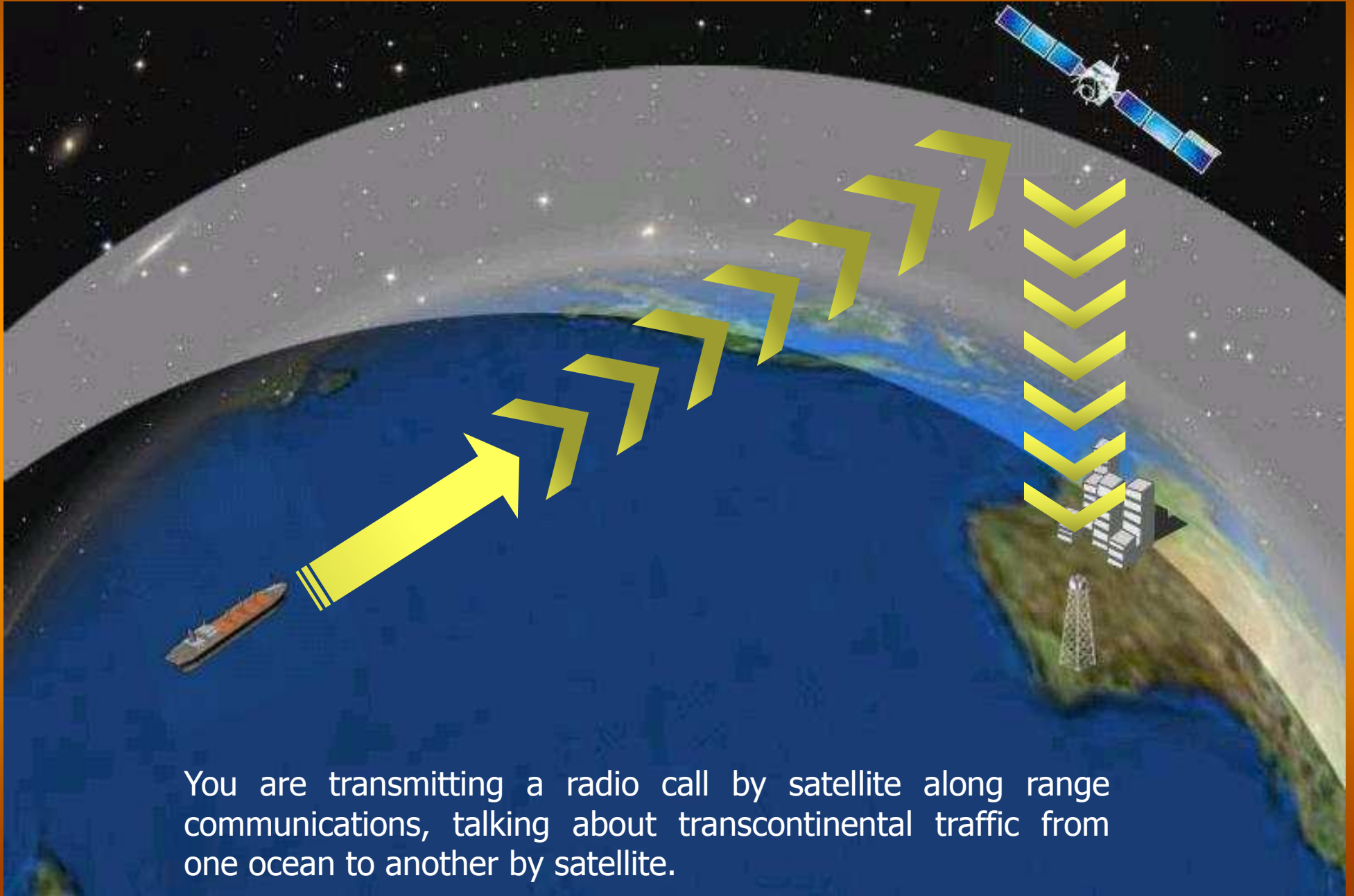
At night time 16 MHz will not work, if your call is between day and night zones 12 MHz is a good alternative.

# Basics Propagations HF Night time 8 MHz



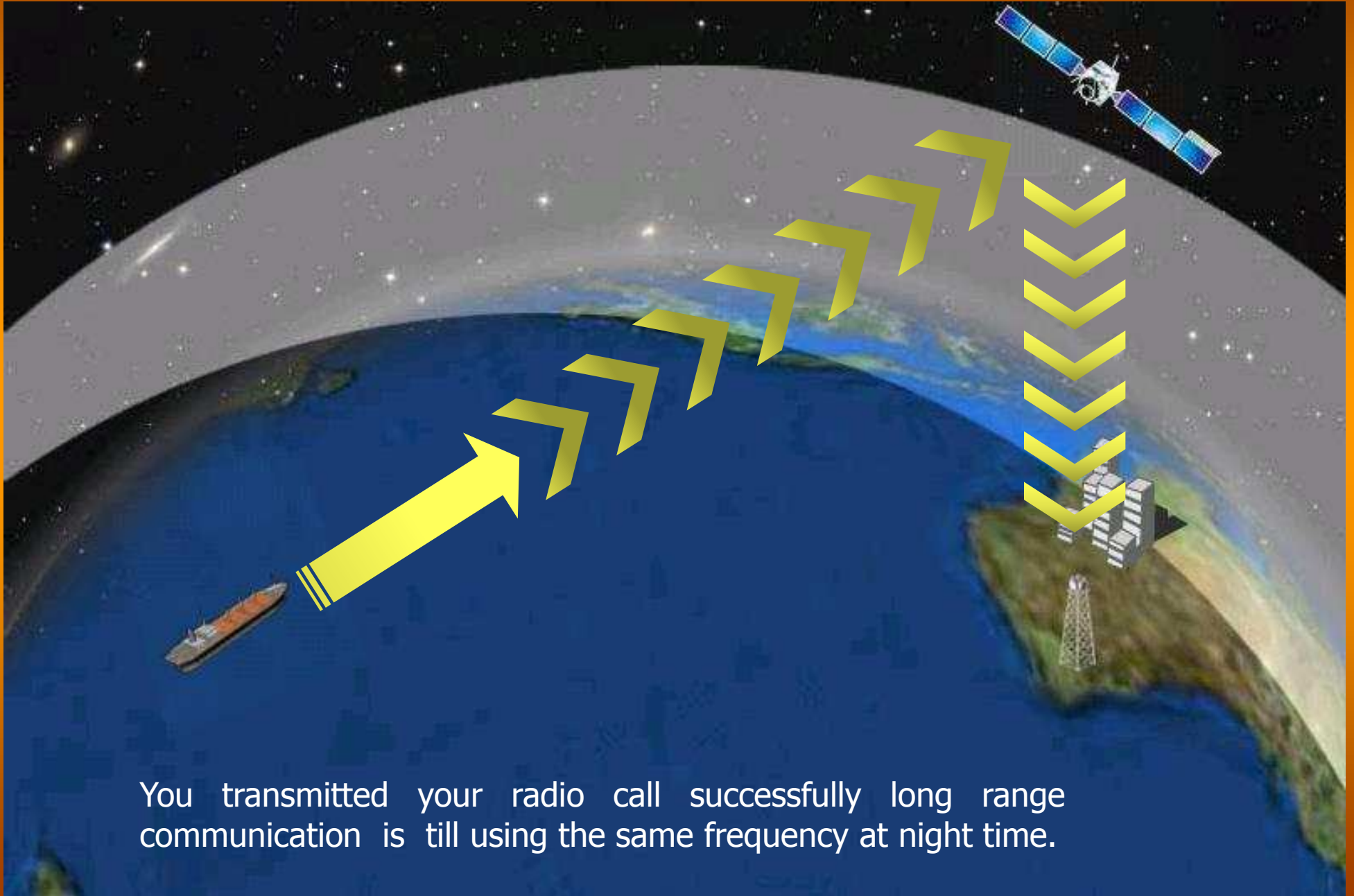
Again you send a radio call from south Africa to Australia using 8 MHz and it was successful. If your call is between day and night zones 12 MHz is a good alternative.

# Basics Satellite Day time



You are transmitting a radio call by satellite along range communications, talking about transcontinental traffic from one ocean to another by satellite.

# Basics Satellite Night time

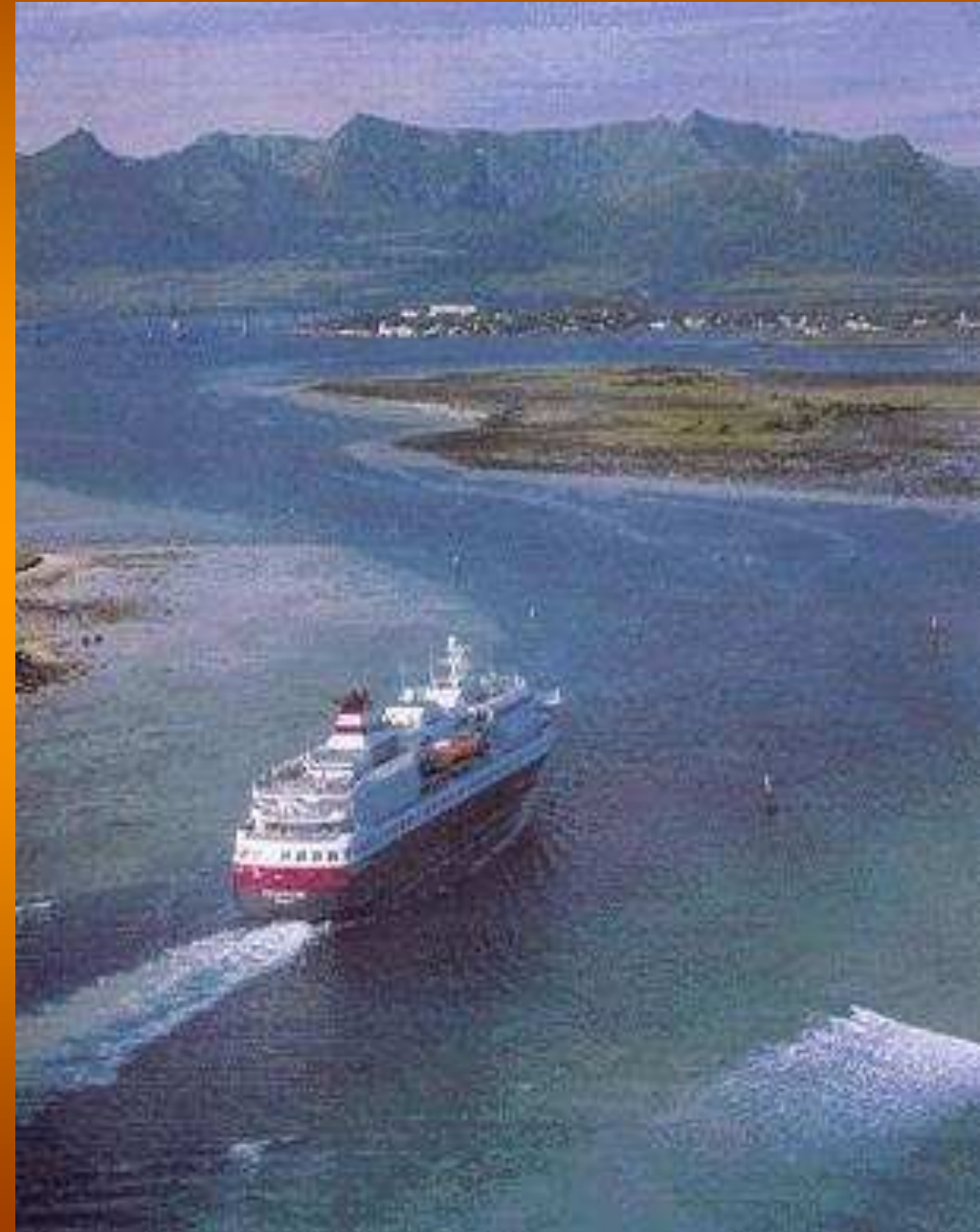


You transmitted your radio call successfully long range communication is still using the same frequency at night time.

# GMDSS Ship requirements

By the terms of the SOLAS Convention, the GMDSS provisions apply to cargo ships of 300 gross tons and over and ships carrying more than 12 passengers on international voyages.

Unlike previous shipboard carriage regulations that specified equipment according to *size of vessel*, the GMDSS carriage requirements stipulate equipment according to the *area the vessel operates in*.



# GMDSS

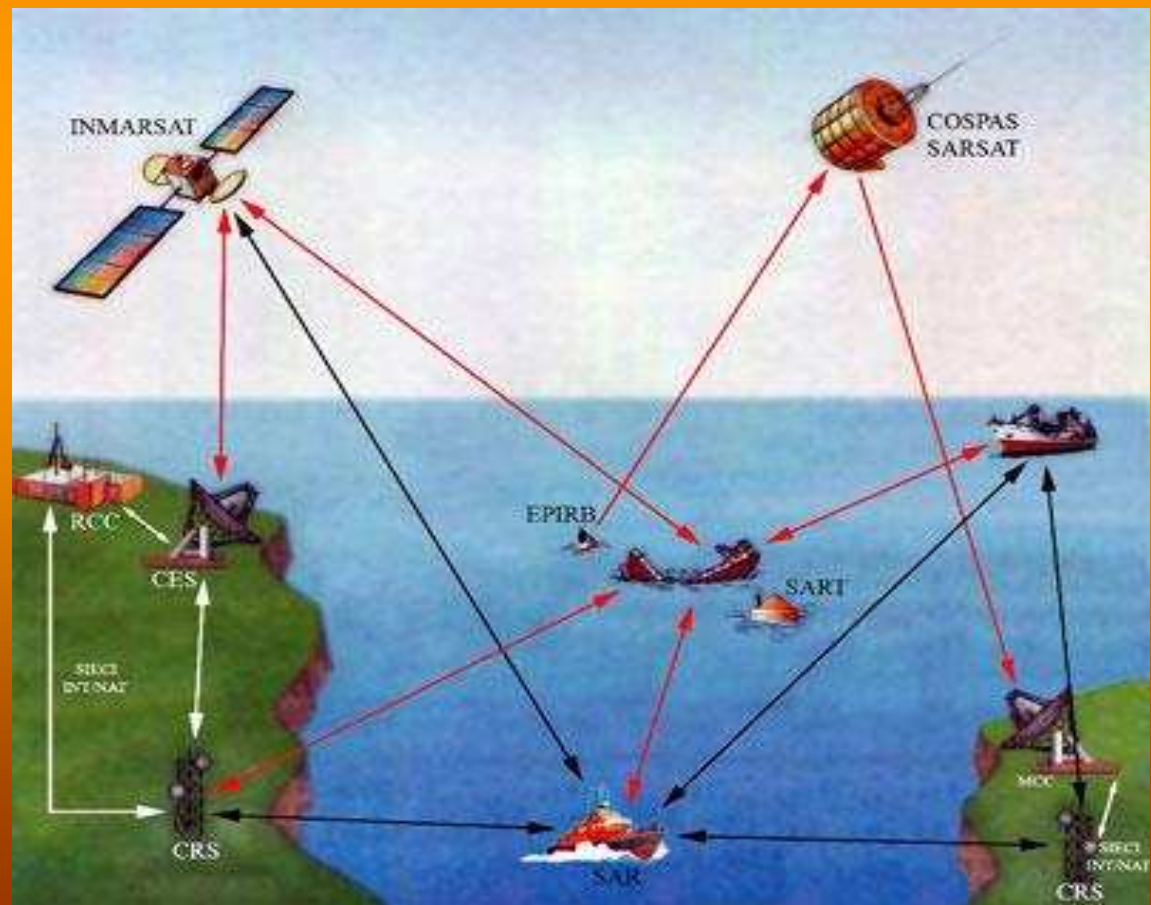
Recreational vessels do not need to comply with GMDSS radio carriage requirements, but will increasingly use the Digital Selective Calling (DSC) VHF radios channel 70 . Offshore vessels may elect to (2187,5 kHz) equip themselves further.

Vessels under 300 Gross Tonnage (GT) are not subject to GMDSS requirements.



# GMDSS

IMO and ITU both require that the DSC-equipped MF/HF and VHF radios be externally connected to a satellite navigation receiver (GPS). That connection will ensure accurate location information is sent to a rescue coordination center if a distress alert is transmitted. The FCC requires that all new VHF and MF/HF maritime radiotelephones type accepted after June 1999 have at least a basic DSC capability. VHF digital selective calling also has other capabilities beyond those required for the GMDSS.





# GMDSS Communication Equipments

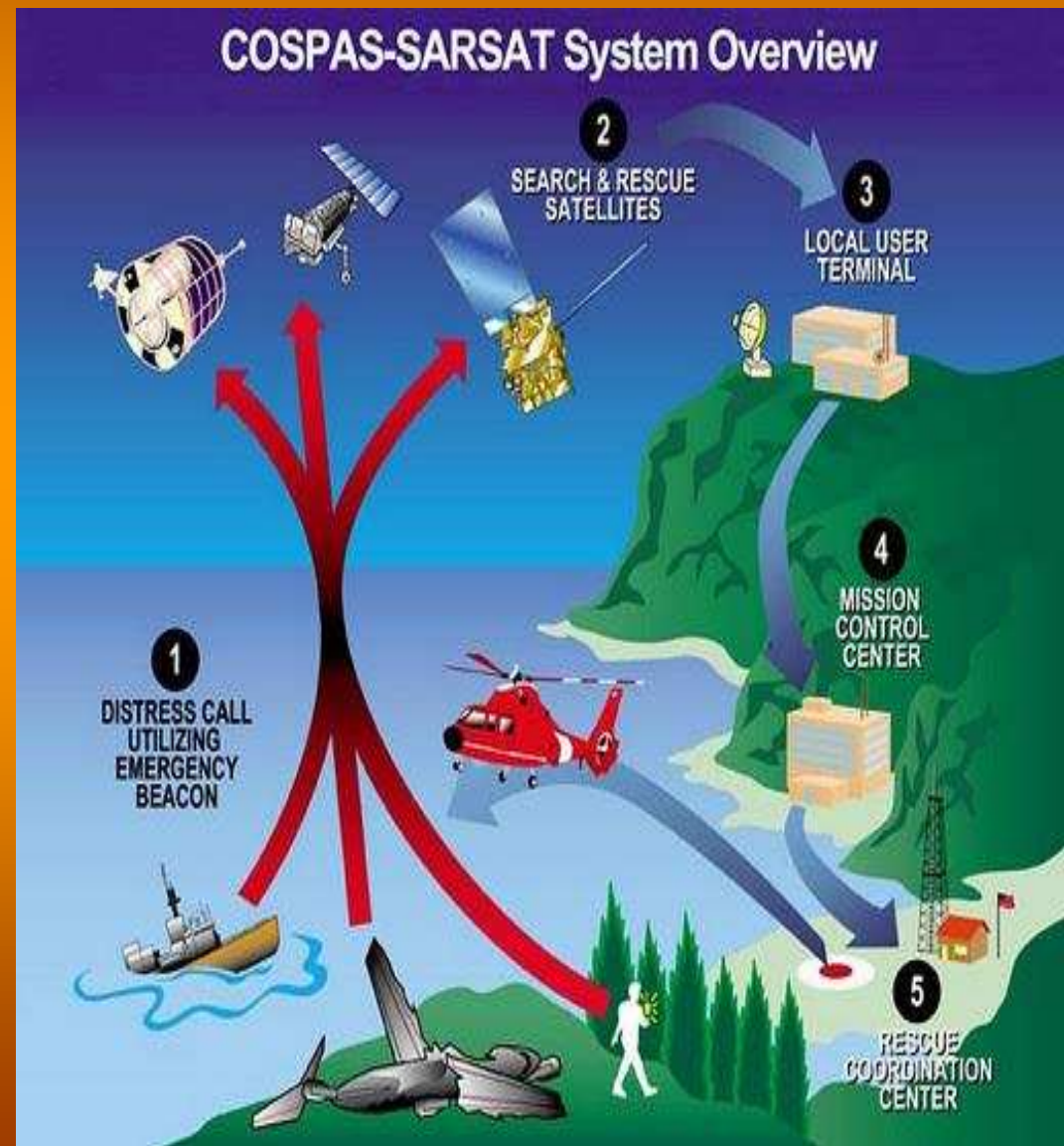
The worldwide communications coverage of the GMDSS is achieved by a combination of satellite (INMARSAT) and terrestrial communication arrangement

## Terrestrial Communications

- Long Range Service - HF
- Medium Range Service - MF
- Short Range Service - VHF

## Satellite Communications

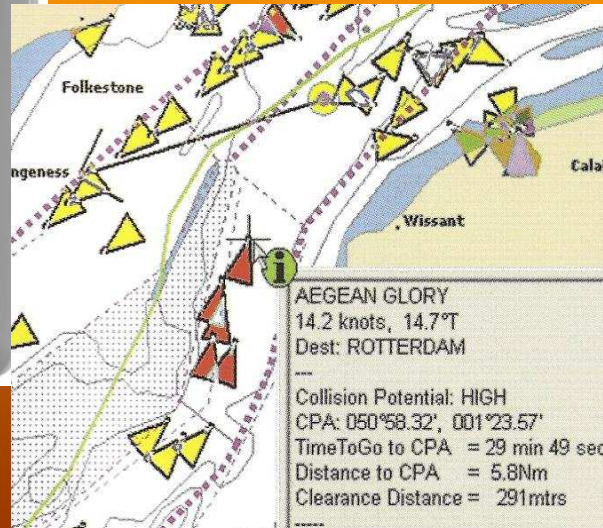
- INMARSAT System
- COSPAS-SARSAT System



# GMDSS

The Coast Guard uses this system to track vessels in Prince William Sound, Alaska, Vessel Traffic Service. IMO and the USCG also plan to require ships carry a Universal Shipborne **Automatic Identification System**, which will be DSC-compatible.

GMDSS telecommunications equipment should not be reserved for emergency use only. The International Maritime Organization encourages mariners to use GMDSS equipment for routine as well as safety telecommunications.



# GMDSS Main types of equipments

Is required to meet the requirements of the functional areas above the following is a list of the minimum communications equipment needed for all ships:

- Until 1 Feb. 1999, a 2182 kHz watch receiver was not in use.



# RADIO DISTRESS COMMUNICATION

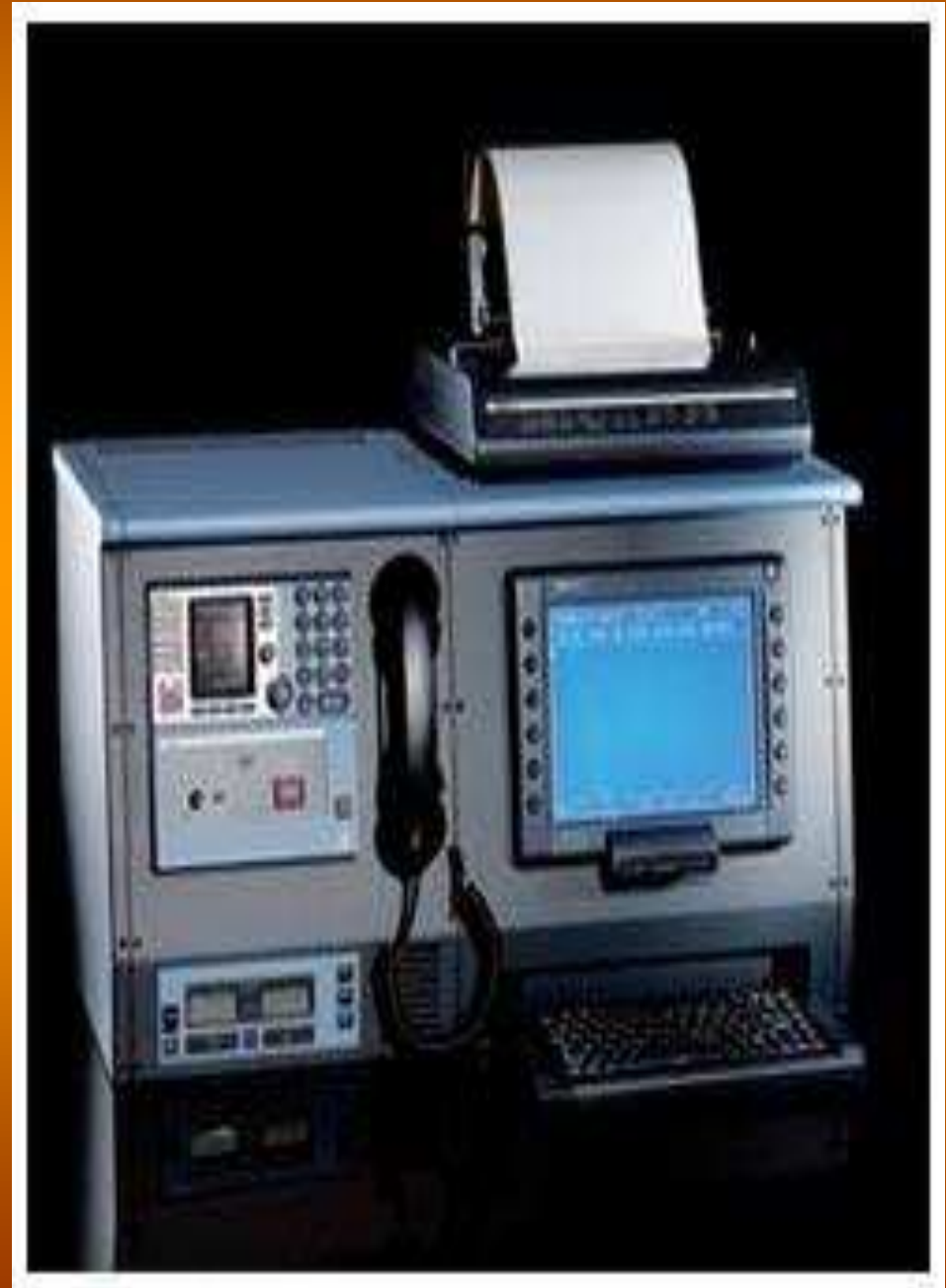


	DIGITAL SELECT CALLING (DSC)	RADIO TELEPHONE	RADIOTELEX
● VHF	● DSC Channel 70	● Channel 16	
● MH	● 2187.5 kHz	● 2182.0 kHz	● 2174.5 kHz
● HF4	● 4207.5 kHz	● 4125.0 kHz	● 4177.5 kHz
● HF6	● 6312.0 kHz	● 6215.0 kHz	● 6268.0 kHz
● HF8	● 8414.5 kHz	● 8291.0 kHz	● 8376.5 kHz
● HF12	● 12577.0 kHz	● 12290.0 kHz	● 12520.0 kHz
● HF16	● 16804.5 kHz	● 16420.0 kHz	● 16695.0 kHz

# GMDSS Main types of equipments

The Inmarsat C provides ship/shore, shore/ship and ship/ship store-and-forward data and email messaging, the capability for sending preformatted distress messages to a rescue coordination center, and the Inmarsat C SafetyNET service. The Inmarsat C SafetyNET service is a satellite-based worldwide maritime safety information broadcast service of high seas weather warnings, NAVAREA navigational warnings, radionavigation warnings, ice reports and warnings generated by the USCG-conducted International Ice Patrol, and other similar information not provided by NAVTEX. SafetyNET works similarly to NAVTEX in areas outside NAVTEX coverage.

Inmarsat C equipment is relatively small and lightweight, and costs much less than an Inmarsat B or F77. Inmarsat B and F77 ship earth stations which require relatively large gyro-stabilized uni directional antennas; the antenna size of the Inmarsat C is much smaller and is omni directional.



# GMDSS Main types of equipments

Under a cooperative agreement with the National Oceanic and Atmospheric Administration (NOAA), combined meteorological observations and AMVER reports can now be sent to both the USCG AMVER Center, and NOAA, using an Inmarsat C ship earth station, at no charge. . SOLAS now requires that Inmarsat C equipment have an integral satellite navigation receiver, or be externally connected to a satellite navigation receiver. That connection will ensure accurate location information to be sent to a rescue coordination center if a distress alert is ever transmitted.

Also the new LRIT long range tracking systems are upgraded via GMDSS Inmarsat C which are also compliant along with inbuilt SSAS, or Ship Security Alert System. SSAS provides a means to covertly transmit a security alert distress message to local authorities in the event of a mutiny, pirate attack, or other hostile action towards the vessel or its crew.



# Equipments HF DSC

A GMDSS system may include High Frequency (HF) radiotelephone and Radiotelex (narrow-band direct printing) equipment, with calls initiated by digital selective calling (DSC). Worldwide broadcasts of maritime safety information can also be made on HF narrow-band direct printing channels.



# Equipments VHF Radios

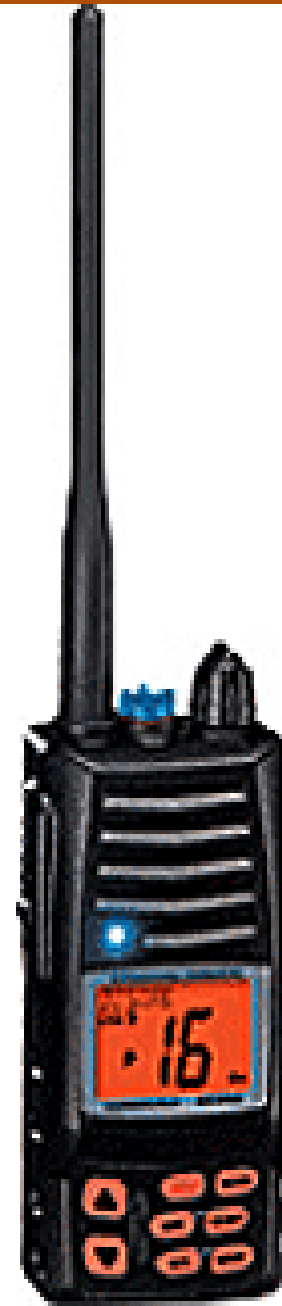
Is is a short range radio communication to other ship or from Shore to ship.





# Equipments Portable VHF Radios

Is used for on-scene communications between life rafts, ships and rescue units it may also be used for onboard communications. Batteries intended for use in Distress situations should not be used for on-board communications.



# GMDSS Radio equipment required for US coastal voyage

Presently, until an A1 or A2 Sea Area is established, GMDSS-mandated ships operating off the U.S. coast must fit to Sea Areas A3 (or A4) regardless of where they operate. U.S. ships whose voyage allows them to always remain within VHF channel 16 coverage of U.S. Coast Guard stations may apply to the Federal Communications Commission for an individual waiver to fit to Sea Area A1 requirements. Similarly, those who remain within 2182 kHz coverage of U.S. Coast Guard stations may apply for a waiver to fit to Sea Area A2 requirements.



# Equipments DSC Radios

The IMO also introduced Digital Selective Calling (DSC) on MF, HF and VHF Marine Radios as part of the GMDSS system. DSC is primarily intended to initiate ship-to-ship, ship-to-shore and shore-to-ship radiotelephone and MF/HF radio telex calls. DSC calls can also be made to individual stations, groups of stations, or "all stations" in one's radio range. Each DSC-equipped ship, shore station and group is assigned a unique 9-digit Maritime Mobile Service Identity. DSC distress alerts, which consist of a preformatted distress message, are used to initiate emergency communications with ships and rescue coordination centers. DSC was intended to eliminate the need for persons on a ship's bridge or on shore to continuously guard radio receivers on voice radio channels, including VHF channel 16 (156.8 MHz) and 2182 kHz now used for distress, safety and calling.



A listening watch aboard GMDSS-equipped ships on 2182 kHz ended on February 1, 1999. In May 2002, IMO decided to postpone cessation of a VHF listening watch aboard ships. That watch keeping requirement had been scheduled to end on 1 February 2005.

# Equipments DSC Radios

## VHF DSC Distress Alert

### Contents of Transmission:

- Ships' Identity – MMSI
- Nature of Distress
- ship's last known Position
- the time position was valid

Watching channel VHF Ch 70

Subsequent communication follows on VHF Ch 16



DSC DISTRESS Alerts go through very quickly as it is subsequently connected the differently nautical equipment on the bridge such as GPS.

# Equipments DSC Radios

MF - HF DSC Distress Alert

Contents of Transmission:

- Ships' Identity – MMSI
- Distress Frequency
- Nature of Distress
- ship's last known Position
- the time position was valid

Subsequent communication follows on  
Telephony or Telex



GMDSS equipped ship with MF – HF DSC must maintain watch on MF 2187.5 KHz and the HF 8414.5 KHz and least one of the other DSC Frequencies.

NOTE: if equipment is update from GPS, ship's position is automatically updated. Otherwise the ship's position must be updated manually every 4 hours.

# DSC Distress Frequency 8414,5 kHz

Other frequencies depending on the time of the day

● 4207,5 kHz

● 6312 kHz

● 12577 kHz

● 1604,5 kHz

MF band;

● 2187.5 kHz

● 4207.5 kHz,

● 6312 kHz,

● 8414.5 kHz, (Emergency)

HF band;

● 12577 kHz

● 16804.5 kHz

VHF band.

● 156.525 MHz (channel 70)



# Equipments MF-HF Radio System



Power supply

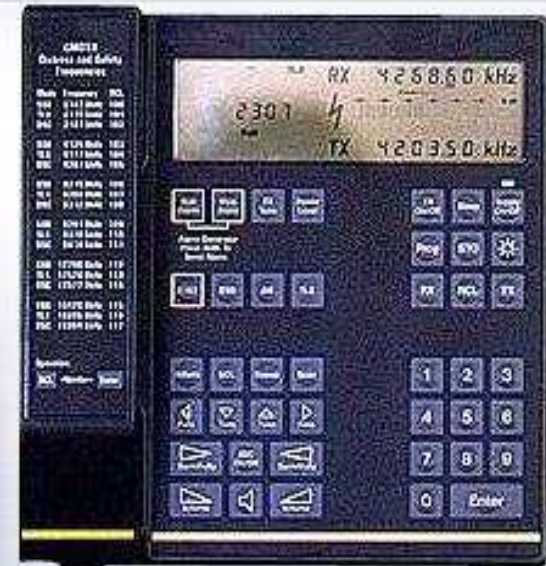


Transceiver

MF/HF antenna



Antenna tuning



MF/HF radio control unit

# Equipments MF-HF with DSC



MF/HF DSC



# Equipments INMARSAT B System

Provides tow way telephony and telex communication the telephone channel can also provides fax and data communication. A push button gives Distress priority for a telephone or telex call.



# Equipments INMARSAT C System

Is a store and forward messaging system a message from a ship can be send from a telex fax or computer ashore. You can send a Distress alert with the ship's identity, position and time by pressing the Distress button, and the INMARSAT C is one way of receive maritime safety information.



The antenna is small and shall be installed to insure that you stay in line of sight of the satellite.

NOTE: if equipment is update from GPS, ship's position is automatically updated. Otherwise the ship's position must be updated manually every 4 hours.

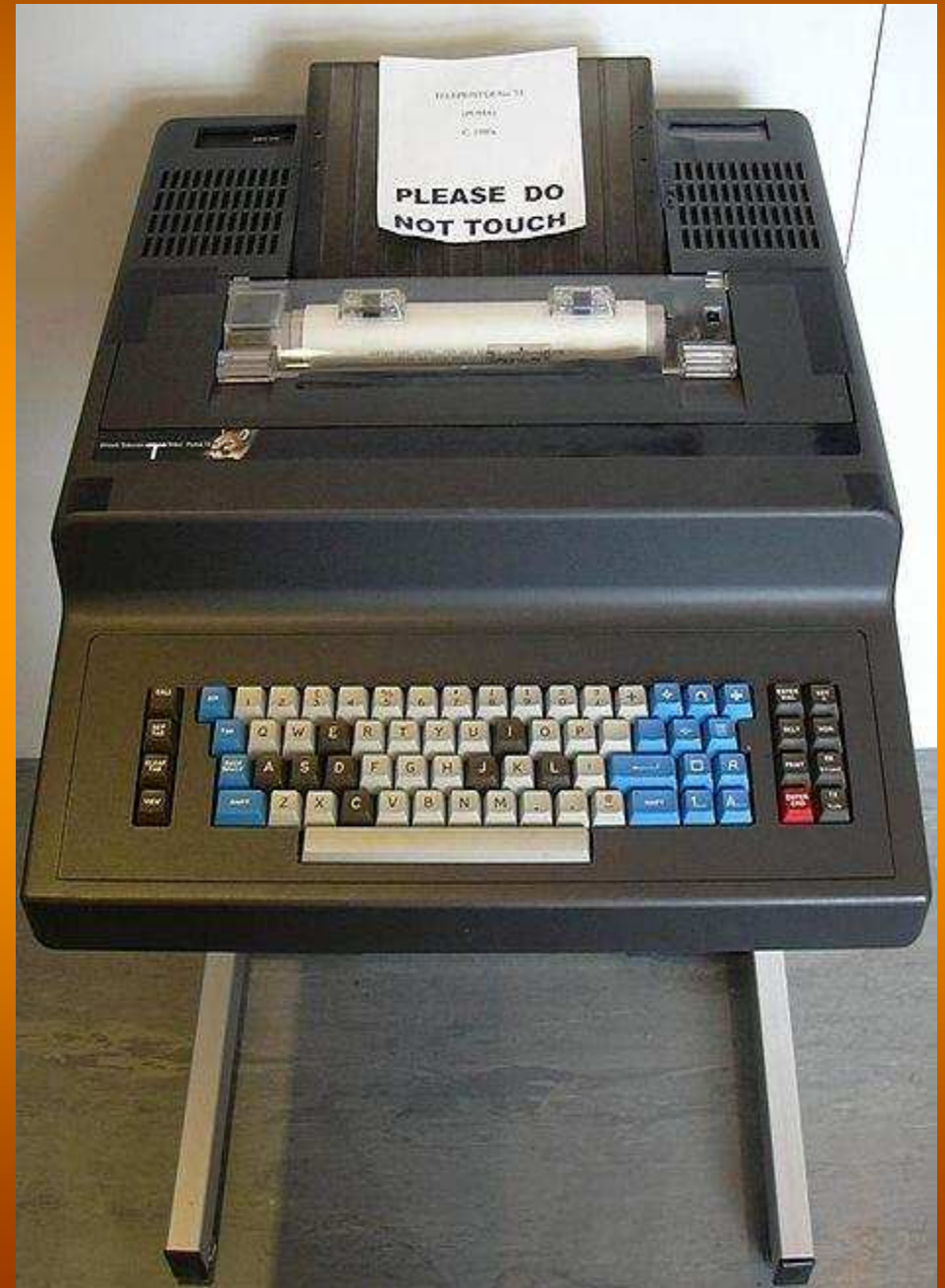


The transceiver interface with the and the satellite system, this transceiver consist of a transmitter and a receiver to ensure safe communication by a satellite to the Coast Earth Station (CES).

# Equipments Radio Telex

Mandatory if the ship is required to carry and HF radio installation.

- an alternative to radio telephony for distress and general radio communication
- used for receiving MSI transmitted on HF frequencies



# Emergency Position Indicating Radio Beacon (EPIRB)

**EPIRB** – one of the most important life saving equipment. Operating EPIRB means that somebody is in distress and an immediate assistance is needed. If the vessel sinks, the EPIRB will be automatically released from the bracket when

subjected to water pressure at 2-4 meters depth and then float up to the surface. Due to the function of the seawater contacts it will automatically be activated and start to transmit vessels identity and positioning signals to the the COSPAS/SARSAT satellites. It should be examined for physical damages every week. The expiration date or service date of the HRU should be noted.

It transmit Ships Position and Identity; Position information and Additional information which could facilitate rescue unless integrated position fixing device, a 9 GHz radar transponder is activated for location purposes.

Battery operation must be sufficient to operate for 4 hours or for 48 hours, integral features are included for automatic upgrading.

Must operate in an environmental condition of ambient temperature of 20°C – 55°C , icing condition, relative wind speed of 100 knots and stowage temperature of 30°C – 65°C.

Early EPIRBs transmit on an aircraft frequencies of:

- 121.5 MHz - for civil emergencies
- 243 MHz - for military frequencies
- 406 MHz - to give stable fixing for satellites
- 1.6 GHz - with GPS receiver for INMARSAT-EPIRB



# EPIRBS Classifications

Type	Frequency	Description
Class A	121.5/243 MHz	Float-free, automatic activating, detectable by aircraft and satellite. Coverage limited (see Figure 2908).
Class B	121.5/243 MHz	Manually activated version of Class A.
Class C	VHF Ch. 15/16	Manually activated, operates on maritime channels only. Not detectable by satellite.
Class S	121.5/243 MHz	Similar to Class B, except that it floats, or is an integral part of a survival craft.
Category I	121.5/406 MHz	Float-free, automatically activated. Detectable by satellite anywhere in the world.
Category II	121.5/406 MHz	Similar to Category I, except manually activated.

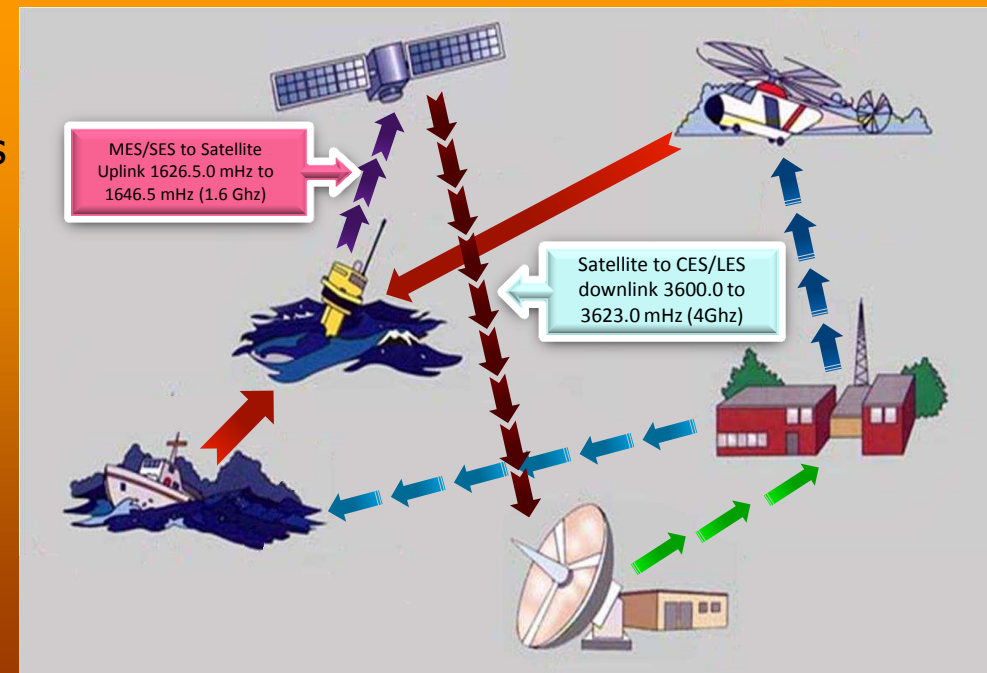


# L-Band Satellite EPIRB

- This provides rapid distress alerting through the INMARSAT System
- Coverage up to +/- 70° Latitudes
- 20 simultaneous alerts within 10 min. time frame

## IT OPERATES

- it transmit 1.6 Ghz Frequency
- activates either automatic or manually
- after activation the EPIRB transmit:
  - ship's position identity
  - position information
  - additional information which could facilitate rescue
- unless integrated position-fixing device, a 9 GHz RADAR transponder is attached for locating purposes
- Battery operated must operate for 4 hours or 48 hours if integral features are included for automatic updating
- Must operate in environment conditions of:
  - Ambient temp of -20°C up to 55°C
  - Icing
  - Relative wind speed of up to 100 knots
  - Storage temp between 30°C and 65°C



The basic Concept of L-Band satellite EPIRB

# EPIRBS Descriptions and Capabilities



**121.5/243 MHz EPIRB's (Class A, B, S):** These are the most common and least expensive type of EPIRB, designed to be detected by overflying commercial or military aircraft. Satellites were designed to detect these EPIRB's but are limited for the following reasons:

1. Satellite detection range is limited for these EPIRB's (satellites must be within line of sight of both the EPIRB and a ground terminal for detection to occur).
2. EPIRB design and frequency congestion cause them to be subject to a high false alert/false alarm rate (over 99%); consequently, confirmation is required before SAR forces can be deployed;
3. EPIRB's manufactured before October 1988 may have design or construction problems (e.g. some models will leak and cease operating when immersed in water) or may not be detectable by satellite.

# EPIRBs Descriptions and Capabilities



**Class C EPIRB's:** These are manually activated devices intended for pleasure craft which do not venture far offshore, and for vessels on the Great Lakes. They transmit a short burst on VHF-FM 156.8 MHz (Ch. 16) and a longer homing signal on 156.75 MHz (Ch. 15). Their usefulness depends upon a coast station or another vessel guarding channel 16 and recognizing the brief, recurring tone as an EPIRB. Class C EPIRB's are not recognized outside of the United States. Class C EPIRB's cannot be manufactured or sold in the United States after February 1995. Class C EPIRB's installed on board vessel's prior to February 1995 may be utilized until 1 February 1999 and not thereafter.



# EPIRBs Descriptions and Capabilities



**406 MHz EPIRB's (Category I, II):** The 406 MHz EPIRB was designed to operate with satellites. Its signal allows a satellite local user terminal to locate the EPIRB (much more accurately than 121.5/243 MHz devices) and identify the vessel (the signal is encoded with the vessel's identity) anywhere in the world. There is no range limitation. These devices also include a 121.5 MHz homing signal, allowing aircraft and rescue vessels to quickly find the vessel in distress. These are the only type of EPIRB which must be tested by Coast Guard-approved independent laboratories before they can be sold for use within the United States.

An automatically activated, float-free version of this EPIRB has been required on SOLAS vessels (cargo ships over 300 tons and passenger ships on international voyages) since 1 August 1993. The Coast Guard requires U.S. commercial fishing vessels to carry this device (unless they carry a Class A EPIRB), and will require the same for other U.S. commercial uninspected vessels which travel more than 3 miles offshore.

# EPIRBs Descriptions and Capabilities



Mariners should be aware of the differences between capabilities of 121.5/243 MHz and 121.5/406 MHz EPIRB's, as they have implications for alerting and locating of distress sites, as well as response by SAR forces. The advantages of 121.5/406 MHz devices are substantial, and are further enhanced by EPIRB-transmitted registration data on the carrying vessel. Owners of 121.5/406 MHz EPIRB's furnish registration information about their vessel, survival gear, and emergency points of contact ashore, all of which greatly enhance the response. The database for U.S. vessels is maintained by the National Oceanographic and Atmospheric Administration, and is accessed worldwide by SAR authorities to facilitate SAR response.

# Testing EPIRBs

EPIRB owners should periodically check for water tightness, battery expiration date, and signal presence. FCC rules allow Class A, B, and S EPIRB's to be turned on briefly (for three audio sweeps, or 1 second only) during the first 5 minutes of any hour. Signal presence can be detected by an FM radio tuned to 99.5 MHz, or an AM radio tuned to any vacant frequency and located close to an EPIRB. FCC rules allow Class C EPIRB's to be tested within the first 5 minutes of any hour, for not more than 10 seconds. Class C EPIRB's can be detected by a marine radio tuned to channel 15 or 16. All 121.5/406 MHz EPIRB's have a self-test function that should be used in accordance with manufacturers' instructions at least monthly.



# Alarm warning and alerting system

If an EPIRB is activated, COSPAS/SARSAT picks up the signal, locates the source and passes the information to a land station. From there, the information is relayed, either via coast radio or satellite, to Rescue Coordination Centers, rescue vessels and nearby ships. This constitutes a one-way only communications system, from the EPIRB via the satellite to the rescuers. It employs low altitude, near polar orbiting satellites and by exploiting the Doppler principle, locates the transmitting EPIRB within about two miles. Due to the low polar orbit, there may be a delay in receiving the distress message unless the footprint of the satellite is simultaneously in view with a monitoring station.



The 406 MHz EPIRB's incorporate an identification code. The digital data coded into each 406 MHz EPIRB's memory provides distress information to SAR authorities for more rapid and efficient rescue. The data includes a maritime identification digit (MID, a 3 digit number identifying the administrative country) and either a ship station identifier (SSI, a 6 digit number assigned to specific ships), a ship radio call sign or a serial number to identify the ship in distress.

With the INMARSAT E satellite EPIRB's, coverage does not extend to very high latitudes, but within the coverage area the satellite connection is instantaneous. However, to establish the EPIRB's position, an interface with a GPS receiver or other sensor is needed.

# EPIRB Coverage Mode



— 406 MHz Only 2.3 nm accuracy 60 min. worldwide avg.  
 — 406 MHz w/GPS 0.05 nm accuracy 15 min. worldwide avg.

EPIRB	Coverage Mode	Position Locating Accuracy	Capacity	
● 121.5 MHz	● Real Time Mode	● +/- 17.2 km	● 10 EPIRBS Simultaneously	
● 406.0 MHz	● Real Time Mode and Global Coverage Mode	● 90% 5.0 km	● 90 EPIRBS Simultaneously	● Transmit a 5Watts RF burst of 0.5sec. Every 50sec

Certain Military Beacons transmit on 243 MHz

# EPIRBS Position Reporting Systems

## Summary comparison of 121.5/406 MHz and 121.5/243 MHz EPIRB's.

<i>Feature</i>	<i>121.5/406 MHz EPIRB</i>	<i>121.5/243 MHz EPIRB</i>
Frequencies	406.025 MHz (locating) 121.500 MHz (homing)	121.500 MHz (civilian) 243.000 MHz (military)
Primary Function	Satellite alerting, locating, identification of distressed vessels.	Transmission of distress signal to Passing aircraft and ships.
Distress Confirmation	Positive identification of coded beacon; each beacon signal is a coded, unique signal with registration data (vessel name, description, and telephone number ashore, assisting in confirmation).	Virtually impossible; no coded information, beacons often incompatible with satellites; impossible to know if signals are from EPIRB, ELT, or non-beacon source.
Signal	Pulse digital, providing accurate beacon location and vital information on distressed vessel.	Continuous signal allows satellite locating at reduced accuracy; close range homing.
Signal Quality	Excellent; exclusive use of 406 MHz for distress beacons; no problems with false alerts from non-beacon sources.	Relatively poor; high number of false alarms caused by other transmitters in the 121.5 MHz band.
Satellite Coverage	Global coverage, worldwide detection; satellite retains beacon data until next earth station comes into view.	Both beacon and LUT must be within coverage of satellite; detection limited to line of sight.
Operational Time	48 hrs. at -20°C.	48 hrs. at -20°C
Output Power	5 watts at 406 MHz, .025 watts at 121.5 MHz.	0.1 watts average.
Strobe Light	High intensity strobe helps in visually locating search target.	`None.
Location Accuracy (Search Area) and Time Required	1 to 3 miles (10.8 sq. miles); accurate position on first satellite overflight enables rapid SAR response, often within 30 min.	10 to 20 miles (486 sq. miles); SAR (Search forces must wait for second system alert to determine final position before responding (1 to 3 hr. delay).

# Search And Rescue Transponder (SART)

The GMDSS installation on ships include one (two on vessels over 500 GT) Search and Rescue Locating device(s) called Search and Rescue Radar Transponders (SART) which are used to locate survival craft or distressed vessels by creating a series of twelve dots on a rescuing ship's 3 cm RADAR display. The detection range between these devices and ships, dependent upon the height of the ship's radar mast and the height of the Search and Rescue Locating device, is normally about 15 km (8 nautical miles). Once detected by radar, the Search and Rescue Locating device will produce a visual and aural indication to the persons in distress.



# Search And Rescue Transponder (SART)

It operates in VHF frequencies between 9.2 - 9.5 GHz . As per GMDSS requirement it is used for locating ships in distress of their survival craft, and should have at least 96 hours sufficient power

It should be mounted as high as possible. IMO require at least 5 n.mi. range. If it is mounted 1 meter above sea level and search antenna is 15m above sea level.

- SART lying on floor – 1.8 n.mi.
- SART standing upright - 2.5 n.mi.
- SART floating on the water - 2.0 n.mi.

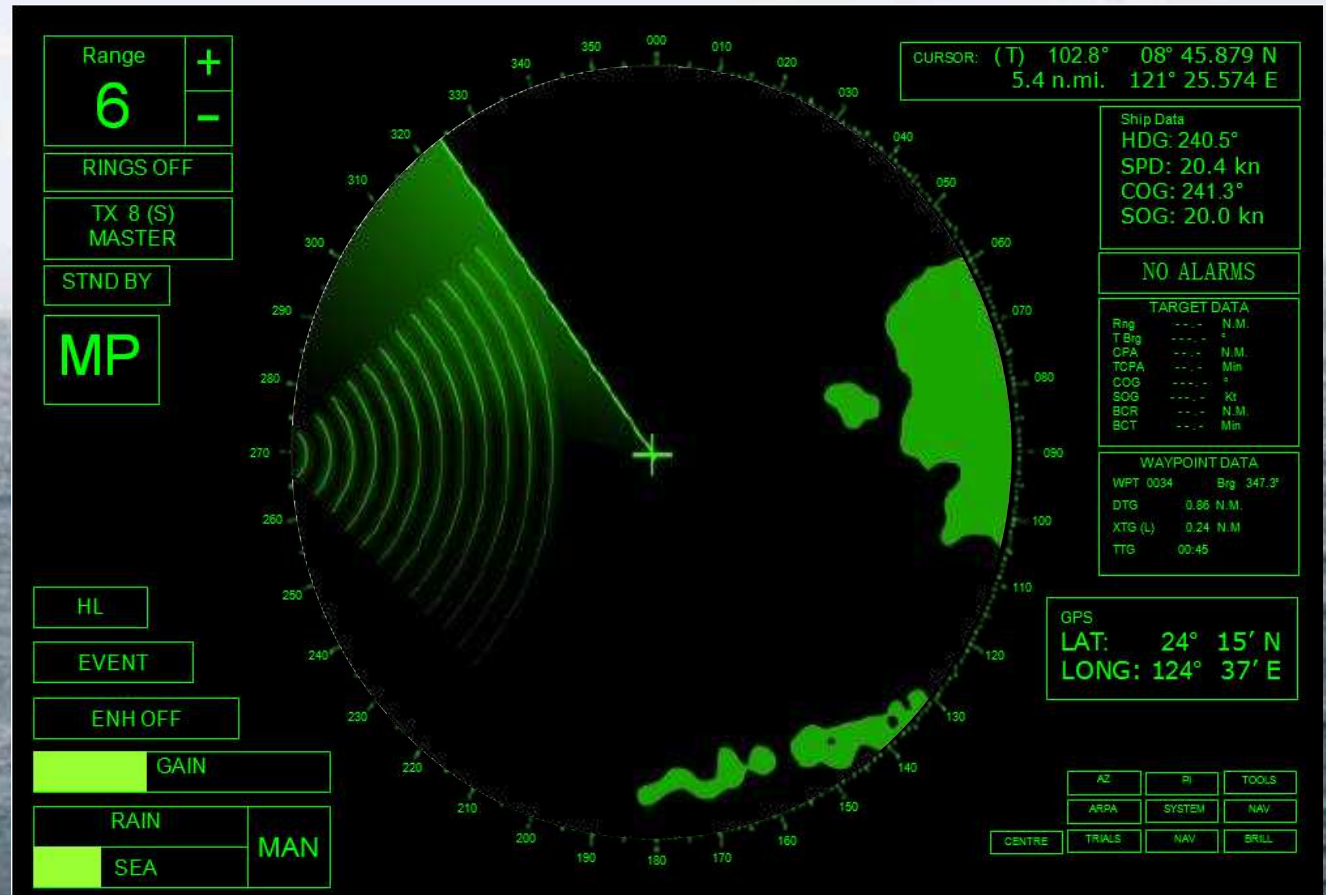




# SART within the vicinity 5 – 6 n. mi



# SART within the vicinity less than 5n.mi



# SART within the vicinity less than 1 n.mi



# NAVTEX

NAVTEX is a maritime radio warning system consisting of a series of coast stations transmitting radio teletype (standard narrow-band direct printing, also sometimes called **Sitor**) safety messages on the internationally standard medium frequency of 518 kHz. Interference from or receipt of stations farther away occasionally occurs at night.

The NAVTEX receiver is a small unit with an internal printer, which takes a minimum of room on the bridge. Its antenna is also of modest size, needing only a receive capability.



# NAVTEX

It is an international, automated system for instantly distributing maritime safety information (MSI) which includes navigational warnings, weather forecasts and weather warnings, search and rescue notices and similar information to ships.

The frequency of transmission of these messages is 518 kHz in English, while 490 kHz is sometime used to broadcast in a local language. The messages are coded with a header code identified by the using single letters of the alphabet to represent broadcasting stations, type of messages, and followed by two figures indicating the serial number of the message.

For example: **FA56** where **F** is the ID of the transmitting station, **A** indicates the message category *Navigational warning*, and **56** is the consecutive message number.



# GMDSS Power Supply

If the main source of electrical power suddenly fail the accumulator provides power for at least one hour for your radio systems, and emergency source will take over when it is ready . All of this should be done automatically the emergency power should last for at least 18 hours.



# **GMDSS** Distress Transmitting Procedures by Radiotelephony

**This is a typical Distress alert by Radio  
Telephony**



# **GMDSS** Distress Transmitting Procedures by Radiotelephony

To be used only if **IMMEDIATE ASSISTANCE** is



**USE PLAIN LANGUAGE WHENEVER POSSIBLE.** If language difficulties are like to arise sending the word **INTERCO** to indicate that the message will be in the International Code of Signals



# **GMDSS** Reception of Safety Messages

## **MAYDAY (Distress)**

**Indicates that a Ship, Aircraft or other vehicle is threatened by grave and imminent danger and request immediate danger.**



**Note:** If you hear any of these words, pay particular attention to the message and call the Master or the Officer on watch

# GMDSS Reception of Safety Messages

## PANPAN (Urgency)

Indicates that the calling station has a very urgent message to transmit concerning safety of a ship, aircraft or other vehicle, or the safety of a person.



**Note:** If you hear any of these words, pay particular attention to the message and call the Master or the Officer on watch

# GMDSS Reception of Safety Messages

## SECURITE (Urgency)

Indicates that the station is about to transmit a message concerning safety of navigation or giving important meteorological warnings.



**Note:** If you hear any of these words, pay particular attention to the message and call the Master or the Officer on watch

# GMDSS Reception of Safety Messages

## NATURE OF DISTRESS IN CODE FROM THE INTERNATIONAL CODE OF SIGNALS

CODE LETTERS	WORDS TO BE TRANSMITTED	TEXT OF SIGNAL
<b>AE</b>	<b>Alfa Echo</b>	I must abandon my vessel
<b>BF</b>	<b>Bravo Foxtrot</b>	Aircraft is ditched in position indicated and requires immediate assistance
<b>CB</b>	<b>Charlie Bravo</b>	I require immediate assistance
<b>CB6</b>	<b>Charlie Bravo Six</b>	I require immediate assistance, I am on fire
<b>DX</b>	<b>Delta X-Ray</b>	I am sinking
<b>HW</b>	<b>Hotel Whiskey</b>	I have collided with surface craft

# **GMDSS** Reception of Safety Messages

## **ANSWER TO SHIP IN DISTRESS**

<b>CODE LETTERS</b>	<b>WORDS TO BE TRANSMITTED</b>	<b>TEXT OF SIGNAL</b>
<b>CP</b>	<b>Charlie Papa</b>	I am proceeding to your assistance
<b>ED</b>	<b>Echo Delta</b>	Your Distress Signal are understood
<b>EL</b>	<b>Echo Lima</b>	Repeat the Distress Signal

# GMDSS Reception of Safety Messages

## NATURE OF DISTRESS IN CODE FROM SIGNALS FOR USE WHERE APPROPRIATE | ALL FORMS OF TRANSMISSION

<b>AA</b>	"All after..." (used after the "Repeat Signal" (RPT)) means "Repeat all After..."
<b>AB</b>	"All before..." (used after the "Repeat Signal" (RPT)) means "Repeat all Before..."
<b>AR</b>	Ending signal or End of Transmission or Signal
<b>AS</b>	Waiting Signal or Period
<b>BN</b>	"All between...and..." (used after the "Repeat Signal" (RPT)) means "Repeat all in between...and..."
<b>C</b>	Affirmative-YES or "the significance of the previous group should be read in the affirmative".
<b>CS</b>	"What is the Name and or Identity Signal of your vessel or Station
<b>DE</b>	"From..."(used to precede the name or Identity Signal of the Calling Station)
<b>K</b>	"I wish to communicate with you" or "Invitation to communicate"
<b>NO</b>	Negative-NO or the "the significance of the previous group should be read in the Negative". When used in voice transmission the pronunciation should be "NO"
<b>OK</b>	Acknowledging a correct repetition or "It is correct"
<b>RQ</b>	Interrogative, or "The significance of the previous group should be read as a question'.
<b>R</b>	"Received" or "I have received your last Signal"
<b>RPT</b>	Repeat Signal "'I Repeat" or "repeat what you have sent" or "Repeat what you have received"
<b>WA</b>	"Word or group after..." (used after the "Repeat Signal" (RPT)) means "Repeat word or group after..."
<b>WB</b>	"Word or group Before..." (used after the "Repeat Signal" (RPT)) means "Repeat word or group before..."

# GMDSS Reception of Safety Messages

## SIGNALS TRANSMISSION FLASHING-LIGHT TRANSMISSION

<u>AA AA AA</u> etc	Call for Unknown station or General Call
<u>EEEEEE</u> etc	Erase Signal
<u>AAA</u>	Full Stop or Decimal Point
<u>TTTT</u>	Answering Signal
<u>T</u>	Word or Group Received

**Note:** The procedures “C”, “N” or “NO” and “RQ” cannot be used in conjunction with single letter signal

Signal on COMMUNICATIONS. When these signals are used by voice transmission the letter should be pronounced in accordance with the letter spelling, with the exception of “NO” which in voice transmission should be pronounced as “NO”

# Cancellation of Distress Call

When you have triggered a False or had send out an accidental Distress alert you have to know how to report before it triggers a rescue operation



- Keep watch at the GMDSS Station and wait for acknowledgment
- communicate with RCC that has acknowledge the alert
- If no acknowledgement received contact any RCC or Coast Station.



# In the event of a False Alert

- Keep watch at the GMDSS Station and wait for acknowledgment
- Communicate with RCC that has acknowledge the alert
- If no acknowledgement received contact any RCC or Coast Station.



## To avoid sending out False Alerts

- Make sure that the radio operators are aware of the serious consequences of a false alarm.
- Be careful of the equipment you are not familiar with.
- Routine testing should be done under the supervision of a qualified or designated operator.
- EPIRBs and SART signals should be tested not more than 10 seconds and should only tested by qualified personnel.

**Note:** the best way to avoid False Alerts is to make sure that all personnel on the bridge are regularly trained o how to send distress alerts on the ship's radio equipment.

# GMDSS INMARSAT Satellite System

Satellite systems operated by the INMARSAT, overseen by IMSO, International Mobile satellite Organization are also important elements of the GMDSS. The types of Inmarsat ship earth station terminals recognized by the GMDSS are: Inmarsat B, C and F77. Inmarsat B and F77, an updated version of the now redundant Inmarsat A, provide ship/shore, ship/ship and shore/ship telephone, telex and high-speed data services, including a distress priority telephone and telex service to and from rescue coordination centers. Fleet 77 fully supports the Global Maritime Distress and Safety System (GMDSS) and includes advanced features such as emergency call prioritisation.



# The INMARSAT system

---

The **International Maritime Satellite Organization (INMARSAT)**, a key player within GMDSS, is an international consortium comprising over 75 international partners who provide maritime safety communications for ships at sea. In accordance with its convention, INMARSAT provides the space segment necessary for improving distress communications, efficiency and management of ships, as well as maritime correspondence services.

The basic components of the INMARSAT system include the INMARSAT **space segment, Land Earth Stations (LES), also referred to as Coast Earth Stations (CES), and mobile Ship Earth Stations (SES)**. The INMARSAT space segment consists of 11 geostationary satellites. Four operational INMARSAT satellites provide primary coverage, four additional satellites (including satellites leased from the European Space Agency (ESA) and the International Telecommunications Satellite Organization (INTELSAT) serve as spares and three remaining satellites (leased from COMSAT Corporation, the U.S. signatory to INMARSAT) serve as back-ups.

# The INMARSAT system

---

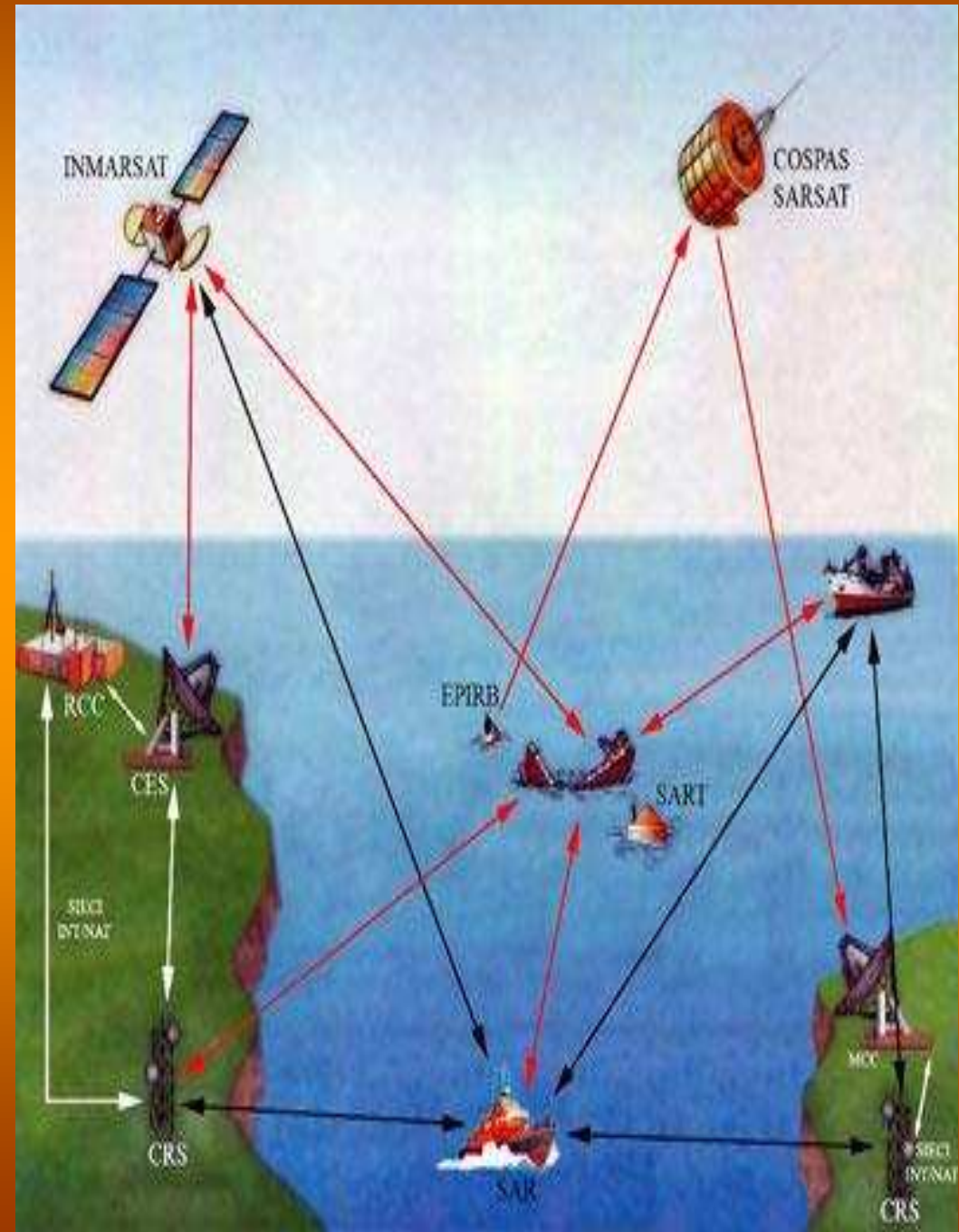
The LES's provide the link between the Space Segment and the land-based National/International fixed communications networks. These communications networks are funded and operated by the authorized communications authorities of a participating nation. This network links registered information providers to the LES.

The data then travels from the LES to the INMARSAT **Network Coordination Station (NCS)** and then down to the SES's on ships at sea. The SES's provide two-way communications between ship and shore. **INMARSAT A, the** original INMARSAT system, operates at a transfer rate of up to 9600 bits per second and is telephone, telex and facsimile (fax) capable. It is being replaced by a similarly sized **INMARSAT B system that uses digital technology to give** better quality fax and higher data transmission rates. **INMARSAT C provides a store and forward data** messaging capability (but no voice) at 600 bits per second and was designed specifically to meet the GMDSS requirements for receiving MSI data on board ship. These units are small, lightweight and use an omni-directional antenna.

# GMDSS

GMDSS sea areas serve two purposes: to describe areas where GMDSS services are available, and to define what radio equipment GMDSS ships must carry (carriage requirements). Prior to the GMDSS, the number and type of radio safety equipment ships had to carry depended upon its tonnage. With GMDSS, the number and type of radio safety equipment ships have to carry depends upon the GMDSS areas in which they travel.

In addition to equipment listed below, all GMDSS-regulated ships must carry a satellite EPIRB, a NAVTEX receiver (if they travel in any areas served by NAVTEX), an Inmarsat-C SafetyNET receiver (if they travel in any areas not served by NAVTEX), a DSC-equipped VHF radiotelephone, two (if between 300 and less than 500 GRT) or three VHF handhelds (if 500 GRT or more), and two 9 GHz search and rescue radar transponders (SART).



# Sea Area requirements under GMDSS

## Sea Area A1

1. General VHF radio telephone capability.
2. Free-floating EPIRB transmitting DSC on channel 70 VHF, or satellite EPIRB.
3. Capability of initiating a distress alert from a navigational position using DSC on either VHF, HF or MF; manually activated EPIRB; or Ship Earth Station (SES).

## Sea Areas A1 and A2

1. Radio telephone MF 2182 kHz and DSC on 2187.5 kHz.
2. Equipment capable of maintaining a continuous DSC watch on 2187.5 kHz.
3. General working radio communications in the MF band 1605-4000 kHz, or INMARSAT SES.
4. Capability of initiating a distress alert by HF (using DSC), manual activation of an EPIRB, or INMARSAT SES.

## Sea Areas A1, A2 and A3

1. Radio telephone MF 2182 kHz and DSC 2187.5 kHz.
2. Equipment capable of maintaining a continuous DSC watch on 2187.5 kHz.
3. INMARSAT A, B or C (class 2) SES Enhanced Group Call (EGC), or HF as required for sea area A4.
4. Capability of initiating a distress alert by two of the following:
  - a. INMARSAT A, B or C (class 2) SES.
  - b. Manually activated satellite EPIRB.
  - c. HF/DSC radio communication.

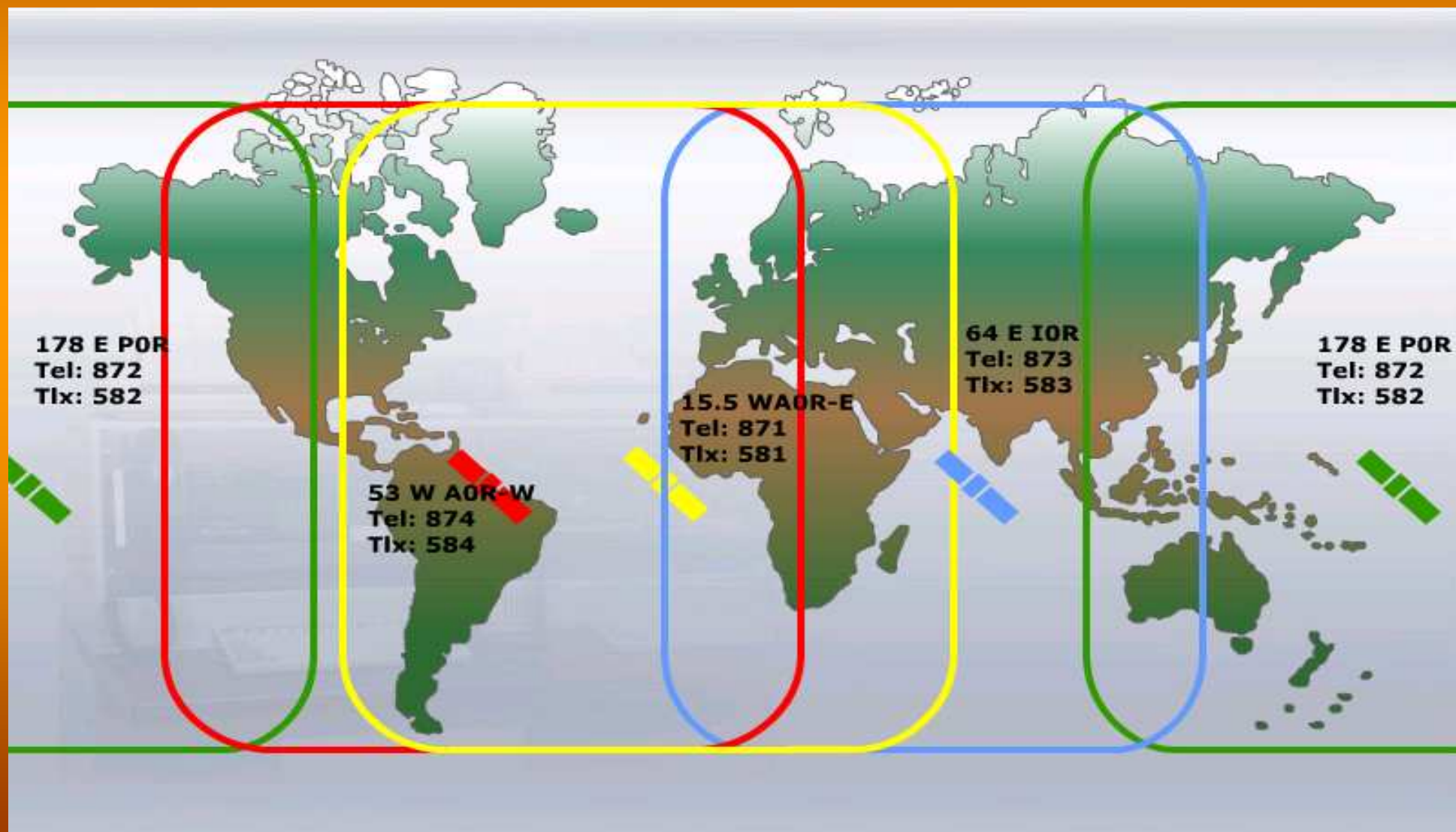
## Sea Area A4

1. HF/MF receiving and transmitting equipment for band 1605-27500 kHz using DSC, radiotelephone and direct printing.
2. Equipment capable of selecting any safety and distress DSC frequency for band 4000-27500 kHz, maintaining DSC watch on 2187.5, 8414.5 kHz and at least one additional safety and distress DSC frequency in the band.
3. Ability to initiate a distress alert from a navigational position via the Polar Orbiting System on 406 MHz (manual activation of 406 MHz satellite EPIRB).

# Sea Area requirements under GMDSS INMARSAT

GMDSS was developed to ensure safety com all around the world. Every waters is defined to as being divided into four sea areas. Your ships should be equipped with the appropriate GMDSS equipment for the different sea areas

The INMARSAT system covers the entire worlds between Lat: 70° N and 70° S each satellites has its own country code telephonies and for telex.



# SEA AREA 1 Atlantic Ocean Region West Long: 53° W

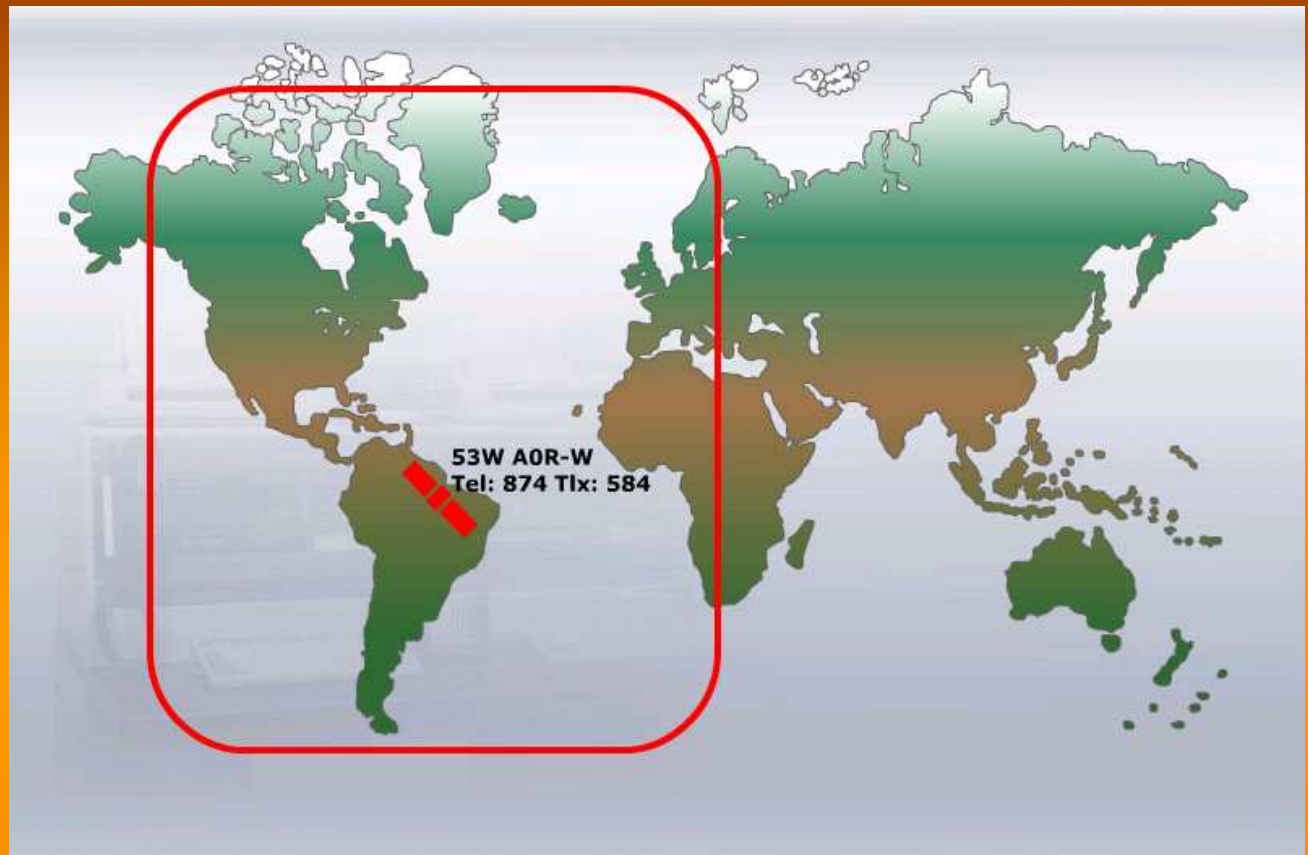
An area within range of at least one VHF coast Station in which continuous DSC alerting is available

## ● Distance:

Depends on the antenna height of VHF coast stations, about 20-50 nm Offshore.

## ● Carriage Requirements

- VHF with DSC
- SART (2 units)
- NAVTEXT (only if Area has NAVTEX Service)
- ECG (Required if Area has no NAVTEX Coverage)
- EPIRB
- Portable VHF (2 -3 units)
- 2182 kHz watch Receiver (until 01 FEB 1999)
- 2182 kHz 2 tone alarm signal (until 01 FEB 1999)



## Radio Communications System

### ● Radio Frequencies:

- VHF Radio telephone
- 156.525 MHz (DSC Ch 70)
- 156.8 MHz (Ch 16)

### ● EPIRBS:

- either 406 Mhz
- COSPAS-SARSAT
- or L-Band (1.6 Ghz)
- VHF EPIRB

### ● Survival Crafts:

- 9 GHz SART
- VHF Portable Radio



# SEA AREA 2 Atlantic Ocean Region East Long: 15,5° W

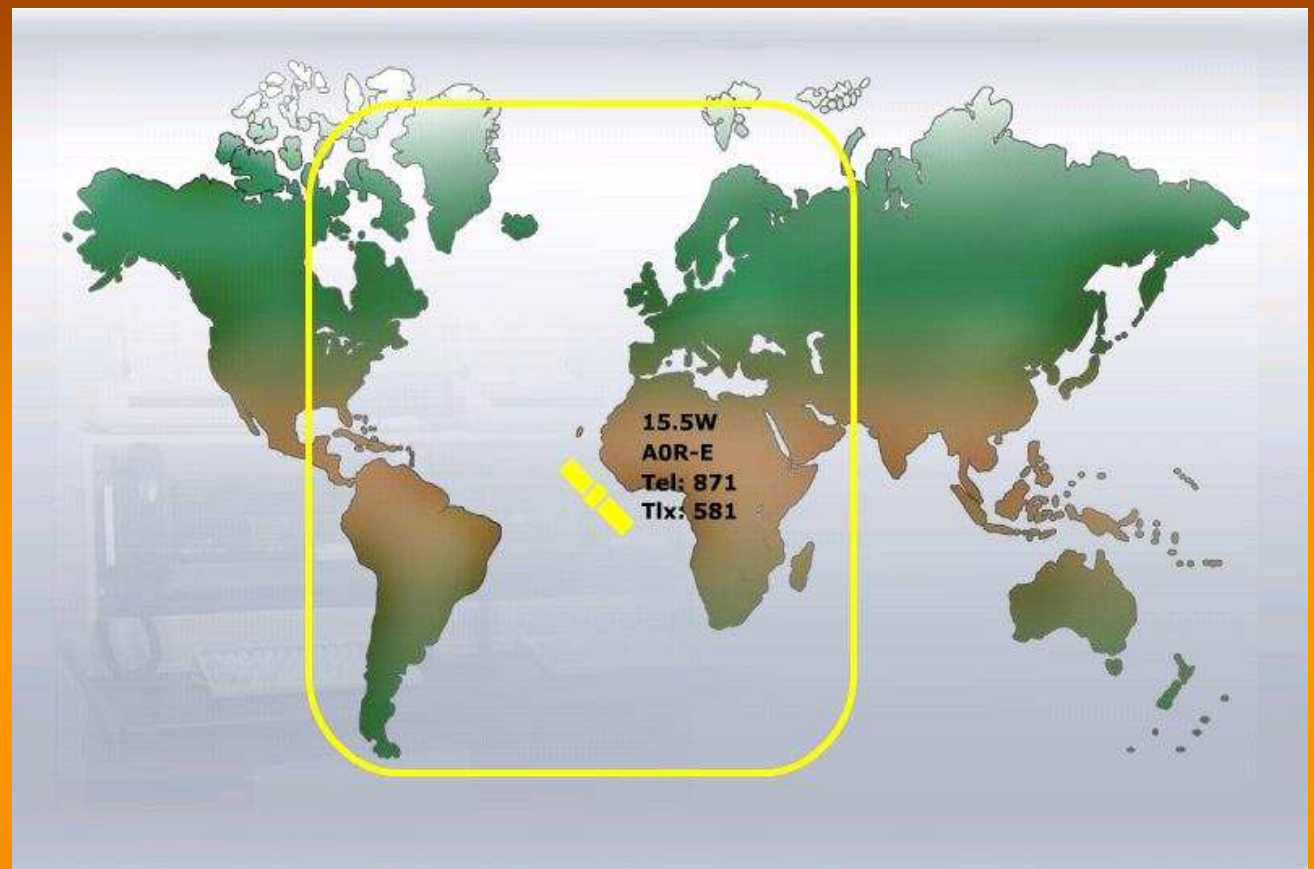
An area Excluding Sea Area 1, with in the radio Telephone coverage of at least one MF Coast Station in which continuous DSC alerting is available.

## Distance:

about from A1 limit to 50 - 400 n. miles offshore

## Carriage Requirements

VHF with DSC  
SART (2 units)  
NAVTEXT (only if Area has NAVTEX Service)  
ECG (Required if Area has no NAXTEX Coverage)  
EPIRB  
Portable VHF (2 -3 units)  
2182 kHz watch Receiver 9until 01 FEB 1999)  
2182 kHz 2 tone alarm signal (until 01 FEB 1999)  
MF Radio Telephone with DSC



## Radio Communications System

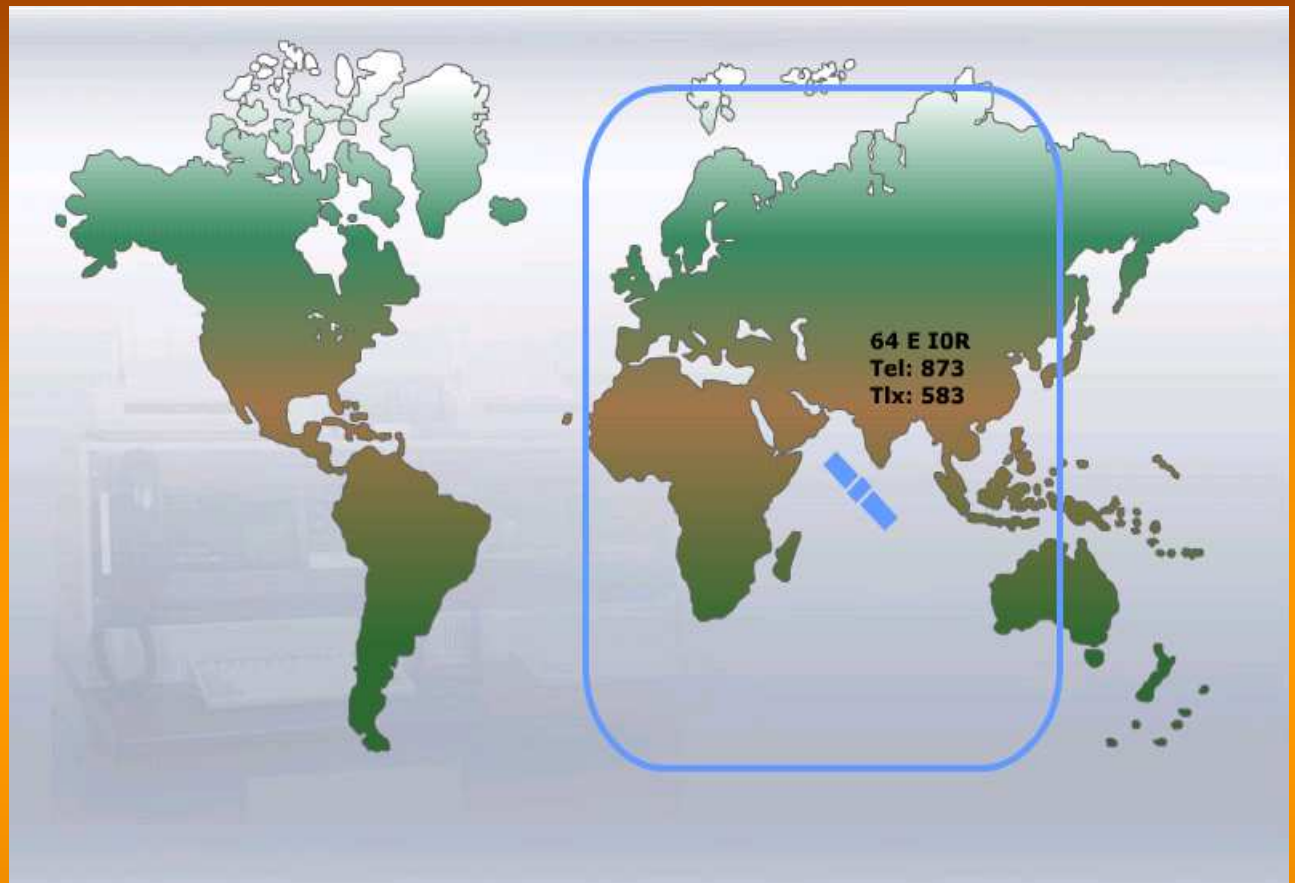
● Radio Frequencies:  
MF and VHF Radio  
2182 kHz radio telephone  
2187.5 kHz DSC  
2174.5 kHz NBDP  
518 kHz NAVTEX

● EPIRBS:  
406 Mhz COSPAS-SARSAT  
or L-Band (1.6 Ghz)

● Survival Crafts:  
9 GHz SART  
VHF Portable Radio

# SEA AREA 3 Indian Ocean Region Long: 64° E

An Area excluding Sea Area A1 and A2, within the coverage of INMARSAT GEOSTATIONARY satellite in which continuous alerting is available



## ● Distance:

70° North - 70° South

## ● Carriage Requirements:

VHF with DSC

SART (2 units)

NAVTEXT (only if Area has NAVTEX Service)

ECG (Required if Area has no NAVTEX Coverage)

EPIRB

Portable VHF (2 -3 units)

2182 kHz watch Receiver 9until 01 FEB 1999)

2182 kHz 2 tone alarm signal (until 01 FEB 1999)

MF Radio Telephone with DSC

INMARSAT A,B, or C

HF Radio Telephone DSC and TELEX

## Radio Communications System

### ● Radio Frequencies:

HF or Satellite

MF and VHF

As A1 and A2 plus 1.5 – 1-6 GHz alerting or A1 and A2 plus all HF frequencies

### ● EPIRBS:

406 Mhz COSPAS-SARSAT  
or L-Band (1.6 Ghz)

### ● Survival Crafts:

9 GHz SART

VHF Portable Radio

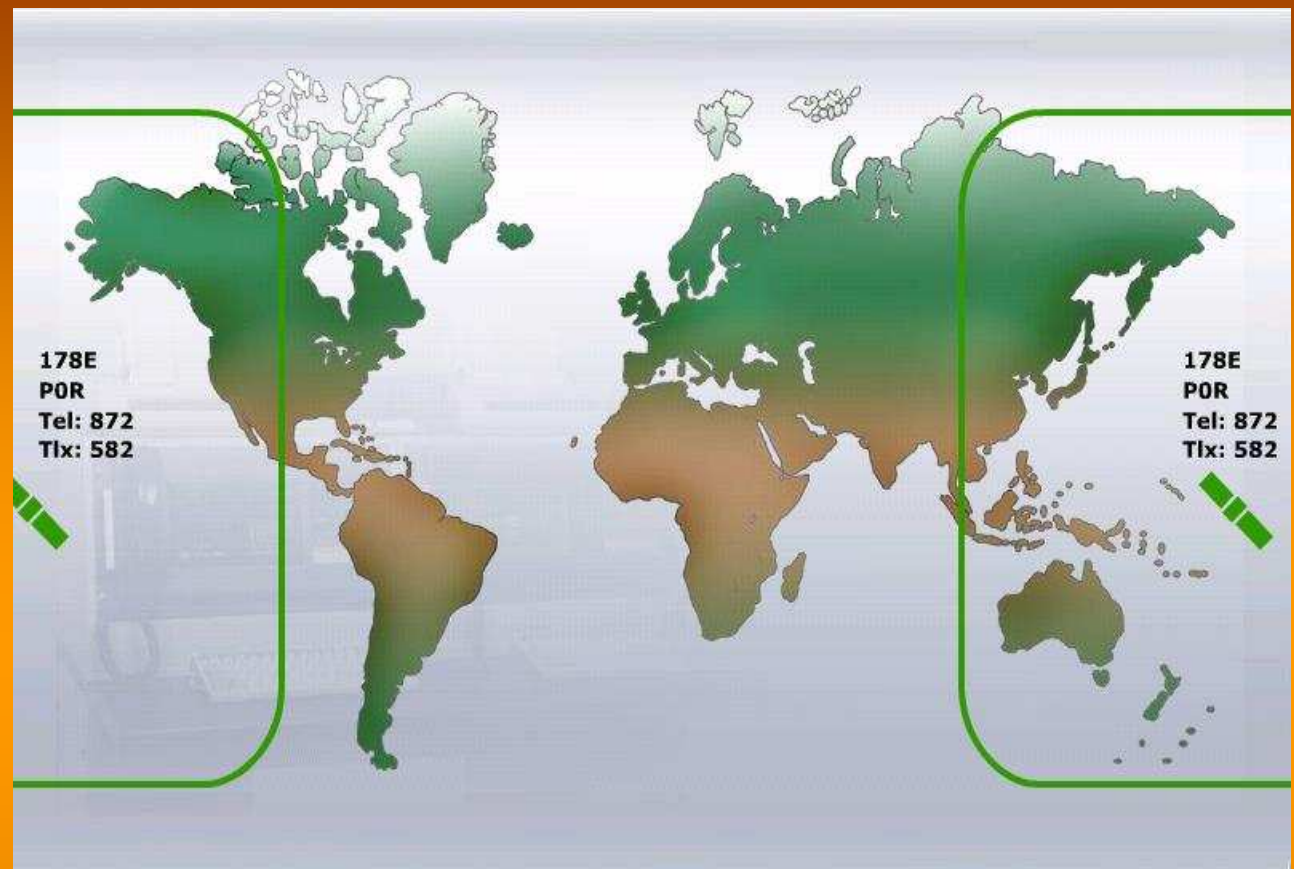
# SEA AREA 4 Pacific Ocean Region West Long: 178° E

An area outside sea Areas A1, A2 and A3 includes the Polar Regions, where Geostationary Satellite coverage is not available

● Distance:  
North of 70°N-South of 70°S

● Carriage Requirements:

- VHF with DSC
- SART (2 units)
- NAVTEXT (only if Area has NAVTEX Service)
- ECG (Required if Area has no NAXTEX Coverage)
- EPIRB (406 MHz COSPAS – SARSAT)
- Portable VHF (2 -3 units)
- 2182 kHz watch Receiver 9until 01 FEB 1999)
- 2182 kHz 2 tone alarm signal (until 01 FEB 1999)
- MF Radio Telephone with DSC
- INMARSAT A,B, or C
- HF Radio Telephone DSC and TELEX



## Radio Communications System

● Radio Frequencies:

HF or Satellite  
MF  
VHF

● EPIRBS:

406 Mhz COSPAS-SARSAT

● Survival Crafts:

9 GHz SART  
VHF Portable Radio

# SEA AREAS – A1

## GMDSS equipment requirement

- A1 – area within range of a VHF Coast Station with DSC

- VHF with DSC
- DSC watch receiver Ch 70
- NAVTEX
- INMARSAT ECG or HF Telex
- EPIRB
- Portable VHF
  - 2 units (300-500 GWT)
  - 3 units (above 500 DWT)
- SART
  - 1 unit (300 – 500 DWT)
  - 2 units (above 500 DWT)



## Additional for Passenger Ships

- Distress Panel
- Automatic updating of position to all relevant radio communication equipment
- Two-way on scene communication on 121.5 MHz and 123.1 MHz on the navigating Bridge

# SEA AREAS – A2

## GMDSS equipment requirement

- A2 – all areas A1, A2, A3 and that is the Polar Area

- VHF with DSC
- DSC watch receiver Ch 70
- MF Telephony – MF DSC
- DSC watch receiver 2187,5
- NAVTEX
- INMARSAT ECG or HF Telex
- EPIRB
- Portable VHF
  - 2 units (300-500 GWT)
  - 3 units (above 500 DWT)
- SART
  - 1 unit (300 – 500 DWT)
  - 2 units (above 500 DWT)



## Additional for Passenger Ships

- Distress Panel
- Automatic updating of position to all relevant radio communication equipment
- Two-way on scene communication on 121.5 MHz and 123.1 MHz on the navigating Bridge

# SEA AREAS – A3

## GMDSS equipment requirement

- A3 – area within coverage of the INMARSAT satellite system but outside the areas A1 and A2.

- VHF with DSC
- DSC watch receiver Ch 70
- Duplicated VHF – DSC
- NAVTEX
- INMARSAT ECG or HF Telex
- EPIRB
- Portable VHF
  - 2 units (300-500 GWT)
  - 3 units (above 500 DWT)
- SART
  - 1 unit (300 – 500 DWT)
  - 2 units (above 500 DWT)

Additional either:

- INMARSAT MF with MF DSC
- DSC watch receiver 2187,5
- duplicated INMARSAT

- HF solution
- MF HF Telephone with DSC and NBDP (radio Telex)
- MF HF DSC

- duplicated INMARSAT or NBDP terminal

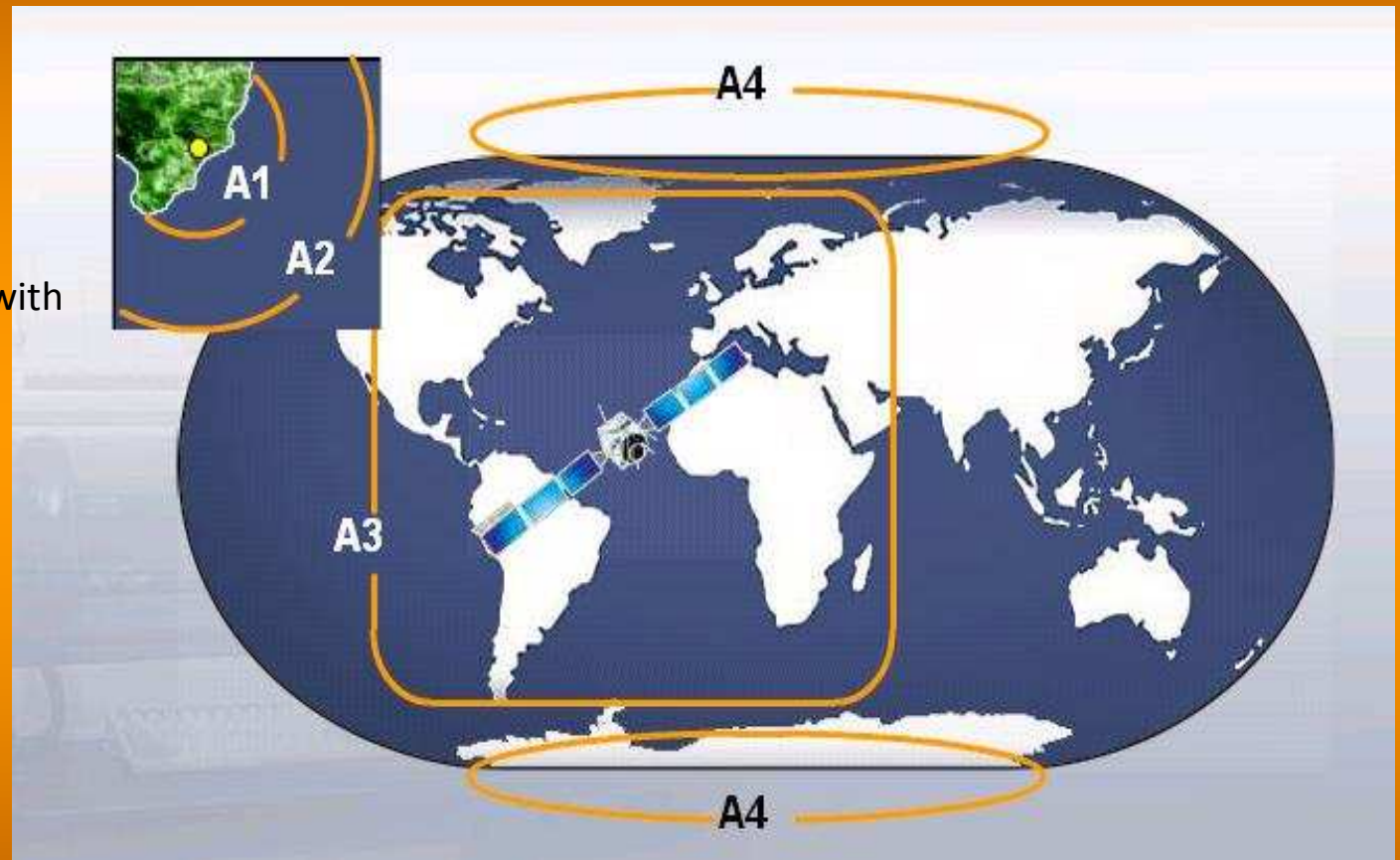


# SEA AREAS – A4

## GMDSS equipment requirement

- A4 – area within coverage of the INMARSAT satellite system but outside the areas A1 and A2.

- VHF with DSC
- DSC watch receiver Ch 70
- MF HF Telephone with DSC and NBDP (radio Telex)
- Duplicated VHF – DSC
- Duplicated MF HF Telephone with DSC and NBDP (radio Telex)
- NAVTEX
- EPIRB
- Portable VHF
  - 2 units (300-500 GWT)
  - 3 units (above 500 DWT)
- SART
  - 1 unit (300 – 500 DWT)
  - 2 units (above 500 DWT)



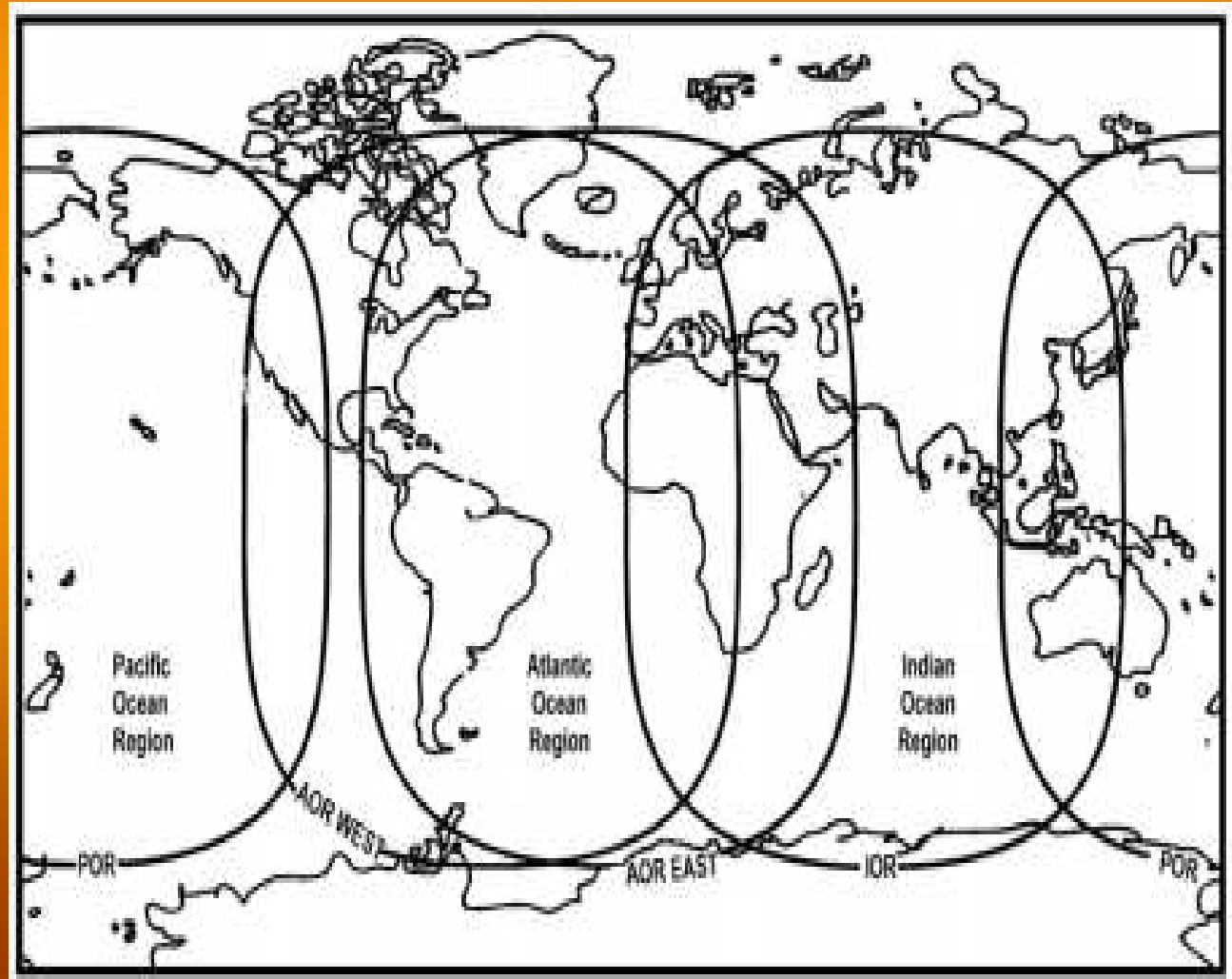
## Additional for Passenger Ships

- Distress Panel
- Automatic updating of position to all relevant radio communication equipment
- Two-way on scene communication on 121.5 MHz and 123.1 MHz on the navigating Bridge

# GMDSS Sea Area

## Sea Areas A1, A2 and A3

1. Radio telephone MF 2182 kHz and DSC 2187.5 kHz.
2. Equipment capable of maintaining a continuous DSC watch on 2187.5 kHz.
3. INMARSAT A, B or C (class 2) SES Enhanced Group Call (EGC), or HF as required for sea area A4.
4. Capability of initiating a distress alert by two of the following:
  - a. INMARSAT A, B or C (class 2) SES.
  - b. Manually activated satellite EPIRB.
  - c. HF/DSC radio communication.

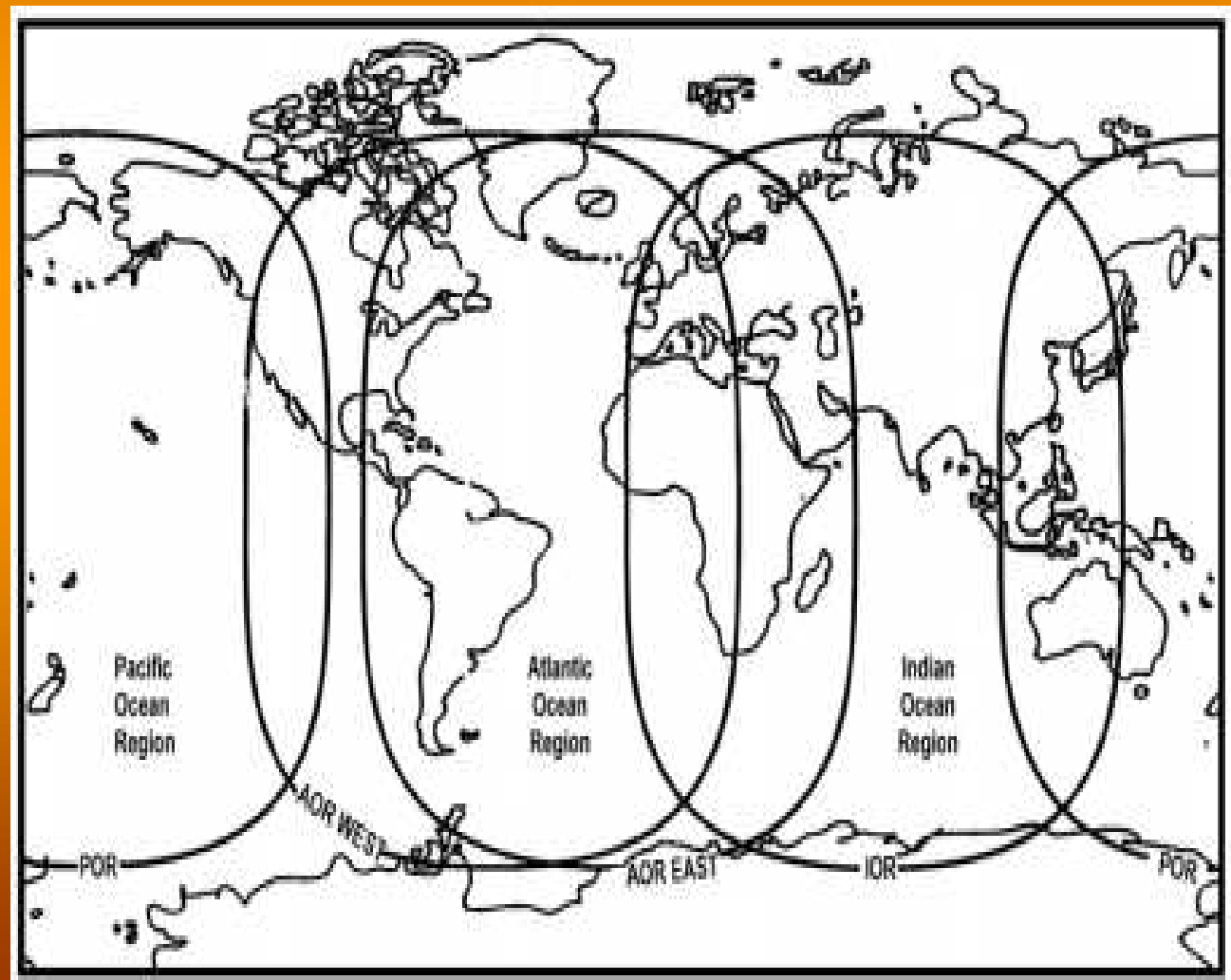




# GMDSS Sea Area

## Sea Area A4

1. HF/MF receiving and transmitting equipment for band 1605-27500 kHz using DSC, radiotelephone and direct printing.
2. Equipment capable of selecting any safety and distress DSC frequency for band 4000-27500 kHz, maintaining DSC watch on 2187.5, 8414.5 kHz and at least one additional safety and distress DSC frequency in the band.
3. Ability to initiate a distress alert from a navigational position via the Polar Orbiting System on 406 MHz (manual activation of 406 MHz satellite (EPIRB)).



# Area Codes for Contacting Ships and Coast Stations

	TELEX	TEL/FAX	DATA
AOR - E	581	871	1111
POR	582	872	1112
IOR	583	873	1113
AOR - W	584	874	1114



● **INMARSAT Telex Two-Digit Code:** Appropriate reference should be made.

CODE	SERVICE	SERVICE
00	Automatic Dialing	Use this code to make automatic telex calls using International telex country codes
32	Medical Advice	Use this code to obtain medical advice. Some LESs have direct connection to Local Hospitals.
38	Medical Assistance	Use this code if the condition of an ill or injured person requires urgent evacuation ashore or doctors medical service onboard. The call is routed to appropriate agency/authority ashore
39	Maritime Assistance	Use this code to obtain maritime assistance if the vessel require immediate help such as Tugs, Oil Pollution team, etc.
42	Navigational hazards and Warnings	This code provides connection to navigational Office for transmission of information from the vessel or any hazards which could endanger safety to navigation (e.g. wrecks, floating obstructions, mines, etc.)
43	Ships Position Reports	This code provides connection to an appropriate national or international center collecting ship movement information for search and rescue purposes e.g. AMVER, AUSREP. Etc.

# Making a Telex Call via INMARSAT A/B

- The message if possible should be prepared in advance: this includes the following information
  - the destination, company or name of the addressee
  - the message originators ' name or title
  - a message reference number or subject of the call
  - the ocean region satellite through which your vessel can be contacted if a reply is required
  - the text of the message

- When making Telex call it is divided into two separate stages- (refer to manufacturer's operation instructions for specific details when making telex calls)
  - establish a link between MES / SES via satellite by your chosen LES/CES
    - select mode and routine Priority (usually available by default)
    - Select LES/CES in your ocean region to which you like to route the call
    - initiate the Telex channel request in accordance to manufacturer's instruction for your MES
    - successfully contact should have been made within 10 sec and LES/CES appear on your printer and video monitor display followed by GA+

Note: if you do not received any indications within 10sec you should retransmit the message request burst

- establish the Telex link between the LES/CES and the Telex Subscriber
  - when you receive the GA+ from the LES, key in the 2 Digit code for the type of telex service you require.
  - key in the access code for the country of destination
  - key in the telex number or the recipient of your call followed by+

AUTOMATIC SERVICE	COUNTRY CODE	RECIPIENT TELEX NUMBER	END OF SELECTION
00	000	00000	+

Note: Within approximately 15 seconds you should receive the answerback of the Telex subscriber you are calling. This indicates that the telex has been successfully established

# INMARSAT SYSTEM

## ● Satellite

## ● Mobile Earth Station

- Ship Earth Station (SES)
- Mobile Earth Station (MES)

## ● Ground Earth Station

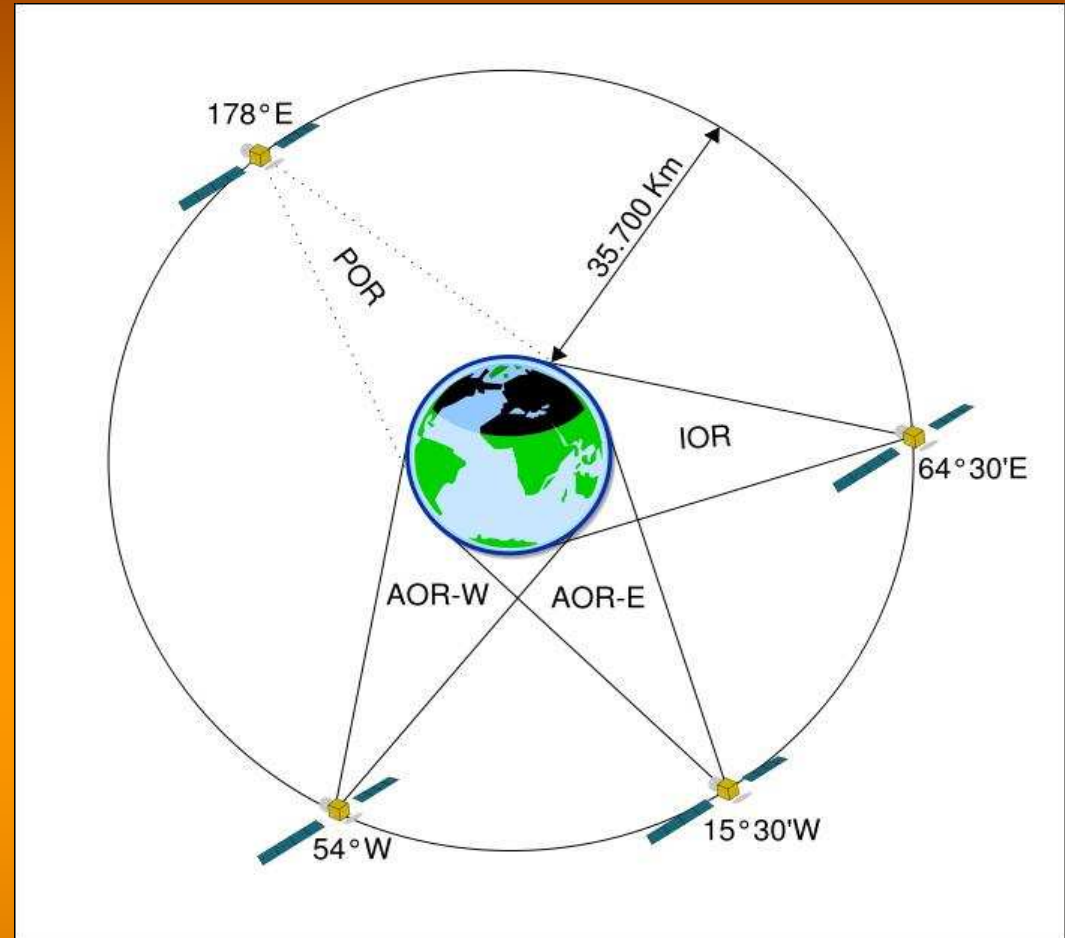
- Coast earth Station (CES)
- Land Earth Station (LES)
- Network Coordination Station (NSC)

## ● Stations Operated by INMARSAT

- Satellite Control Center (SCC)
- Network Operation Center (NOC)

## ● Land User Terminal (LUT)

- There is a range of different shipboard satellite terminal equipment available, each having its own particular features



● INMARSAT – A  
● INMARSAT – B

● INMARSAT – C  
● INMARSAT - M

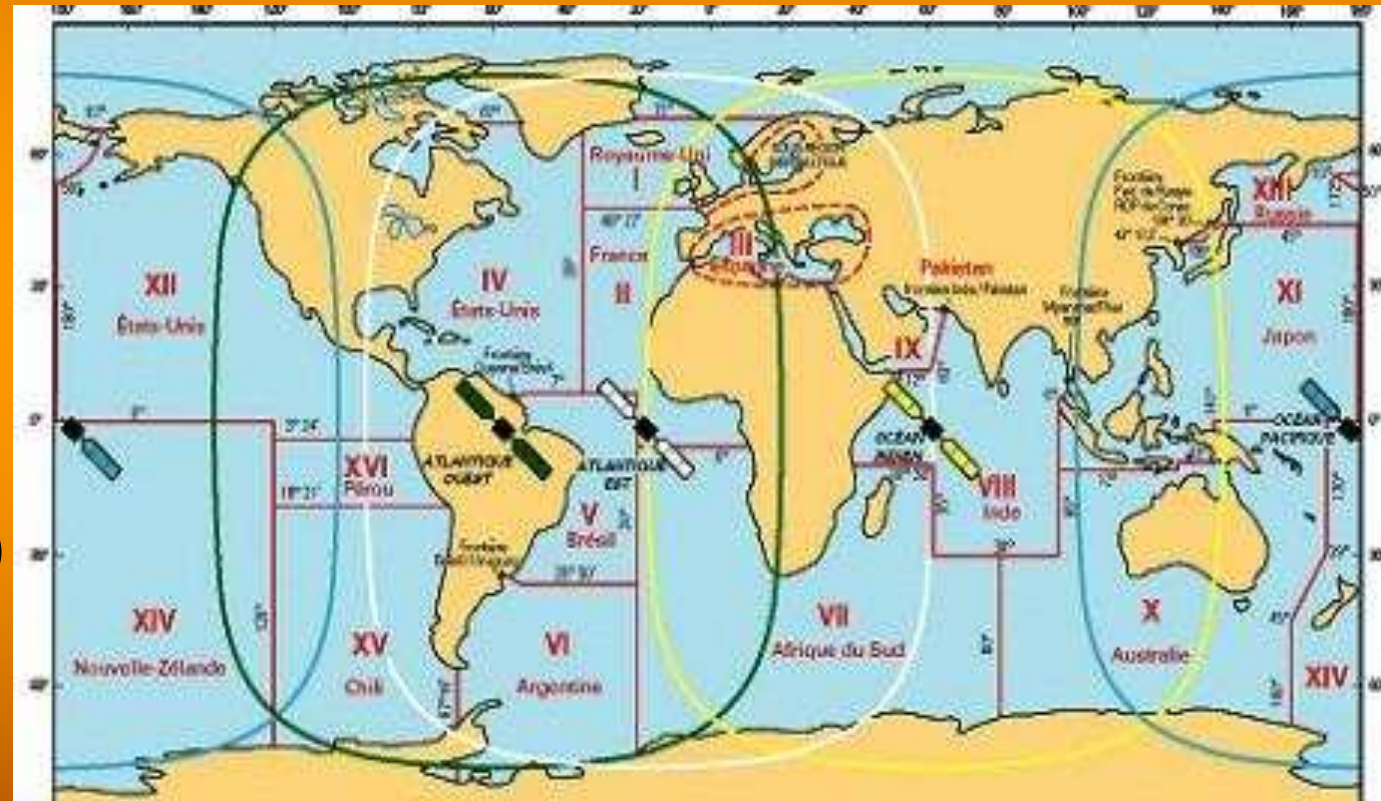
● INMARSAT - E

Each of the above system uses the same four satellites to communicate through, the coast earth stations (or Land Earth Station) may be capable of operating one or any combination or all of the system provided.

# INMARSAT Space Segment

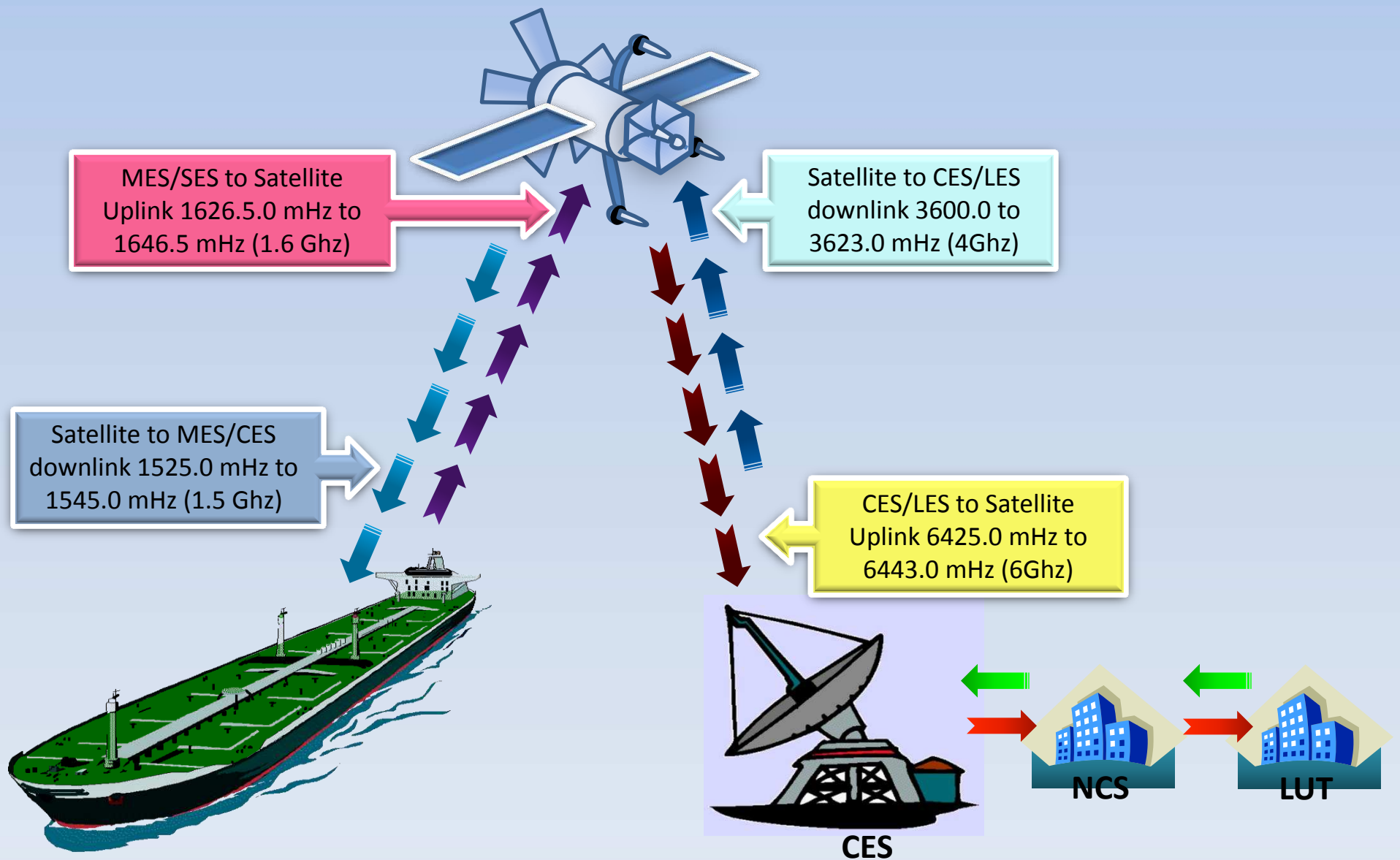
- It comprises four communications satellites with back up satellites ready to be used if necessary.
- Each satellite moves at exactly the same rate as the rotation of the earth. And so remains in the same relative position to the earth, above the earth's equator, each area has a particular area of coverage also known as footprints

- ATLANTIC OCEAN REGION – East (AOR – East)
- ATLANTIC OCEAN REGION – West (AOR – West)
- INDIAN OCEAN REGION (IOR)
- PACIFIC OCEAN REGION (POR)



INMARSAT satellites are controlled from the Satellite Control Center (SCC) based in INMARSAT headquarters in London, UK.

# Satellite Frequencies



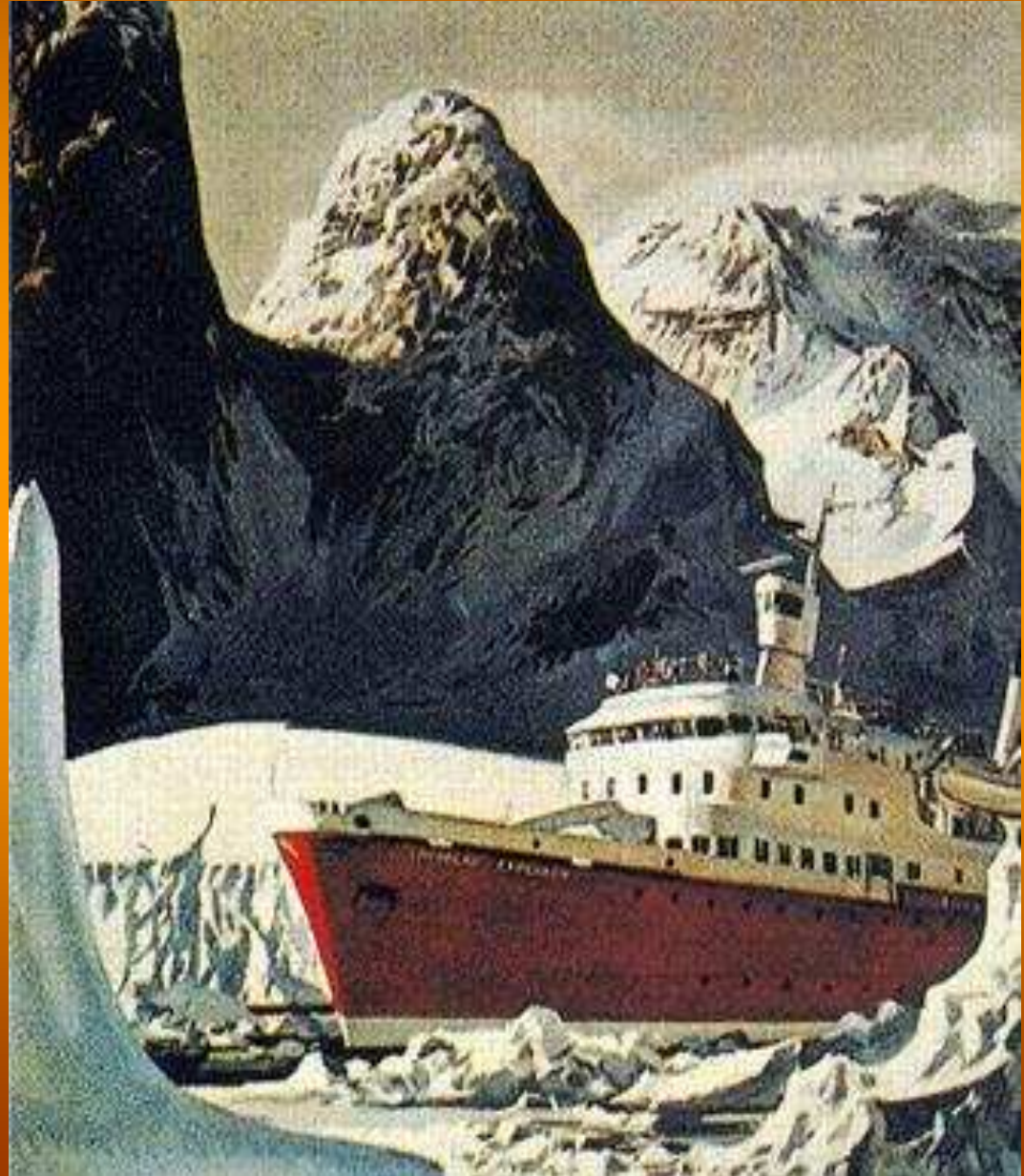
The ground segment comprises a global network of Coast Earth Stations (CESs) Network Coordinating Stations (NCSs) and a Network Operations Center (NOC)

# Maritime Safety Information (MSI)

Major categories of MSI for both NAVTEX and Safety- NET are:

1. Navigational warnings
2. Meteorological warnings
3. Ice reports
4. Search and rescue information
5. Meteorological forecasts
6. Pilot service messages (not in the U.S.)
7. Electronic navigation system messages (i.e., OMEGA, LORAN, DECCA, GPS, DGPS, SATNAV, etc.)

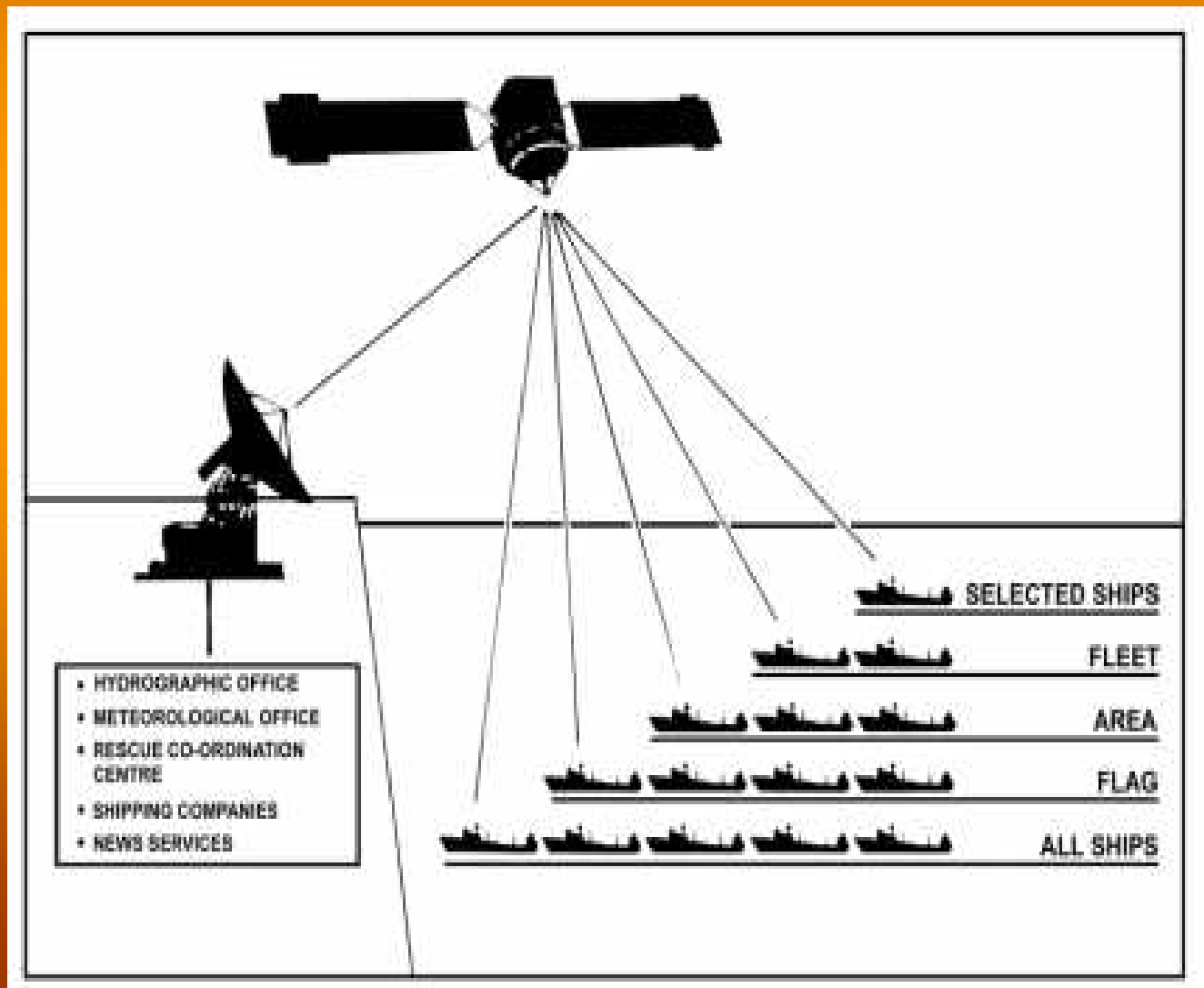
Broadcasts of MSI in NAVTEX international service are in English, but may be in languages other than English, to meet requirements of the host government.



# The safetyNET

SafetyNET is a service of INMARSAT C's Enhanced Group Call (EGC) system. The EGC system (Figure 2804) is a method used to specifically address particular regions or ships. Its unique addressing capabilities allow messages to be sent to all vessels in both fixed geographical areas or to predetermined groups of ships.

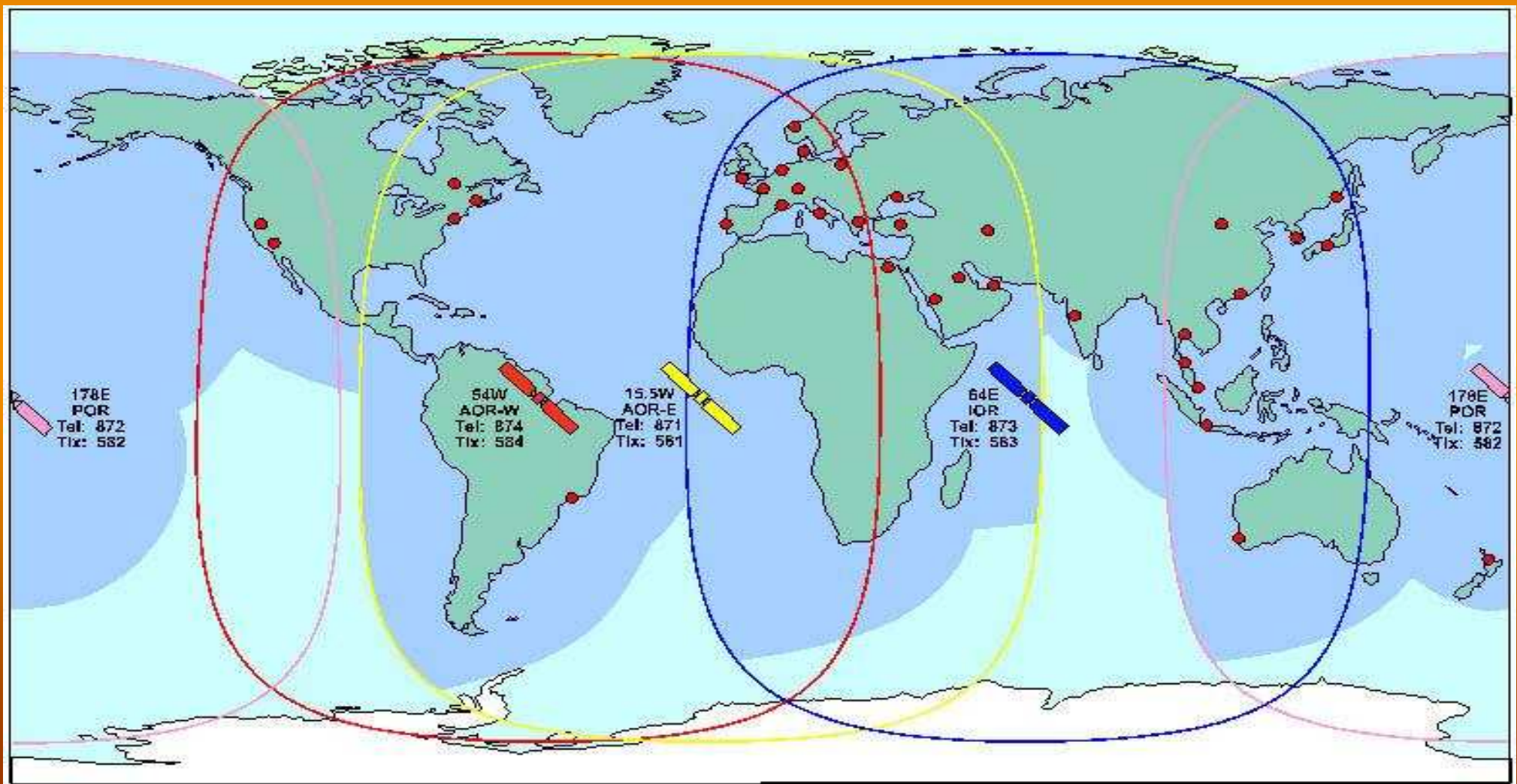
SafetyNET is the service designated by the IMO through which ships receive maritime safety information. The other service under the EGC system, called **FleetNET**, is used by commercial companies to directly (and privately) communicate to their individual fleets.





# The SafetyNET

SafetyNET is an international direct-printing satellite based service for the promulgation of navigational and meteorological warnings, and distress alerts, forecasts, and other safety messages. It fulfills an integral role in GMDSS as developed by the IMO. The ability to receive SafetyNET service information is necessary for all ships that sail beyond coverage of NAVTEX (approximately 200 miles from shore) and is recommended to all administration having the responsibility for marine affairs and mariners who require effective MSI service in waters not served by NAVTEX.



# The safetyNET

---

Reliable delivery of messages is ensured by forward error correction techniques. Experience has demonstrated that the transmission link is generally error-free and low error reception is achieved under normal circumstances.

Given the vast ocean coverage by satellite, some form of discrimination and selectivity in printing the various messages is required. Area calls will be received by all ships within the ocean region coverage of the satellite; however, they will be printed only by those receivers that recognize the fixed area or the geographic position in the message. The message format includes a **preamble that enables the microprocessor in a ship's receiver** to decide to print those MSI messages that relate to the present position, intended route or a fixed area programmed by the operator. This preamble also allows suppression of certain types of MSI that are not relevant to a particular ship. As each message will also have a unique identity, the reprinting of messages already received correctly is automatically suppressed. MSI is promulgated by various information providers around the world. Messages for transmission through the SafetyNET service will, in many cases, be the result of coordination between authorities. Information providers will be authorized to broadcast via SafetyNET by IMO. Authorized information providers are:

1. National hydrographic offices for navigational warnings.
2. National weather services for meteorological warnings and forecasts.
3. Rescue Coordination Centers for ship-to-shore distress alerts and other urgent information.
4. In the U.S., the International Ice Patrol for North Atlantic ice hazards.

# The safetyNET

---

Each information provider prepares their SafetyNET messages with certain characteristics recognized by the EGC service. These characteristics, known as “C” codes are combined into a generalized message header format as follows: C1:C2:C3:C4:C5. Each “C” code controls a different broadcast criterion and is assigned a numerical value according to available options. A sixth “C” code, “C0” may be used to indicate the ocean region (i.e., AOR-E, AOR-W, POR, IOR) when sending a message to an LES which operates in more than one ocean region. Because errors in the header format of a message may prevent its being released, MSI providers must install an INMARSAT SafetyNET receiver to monitor the broadcasts it originates.

This also ensures quality control. The “C” codes are transparent to the mariner but are used by information providers to identify various transmitting parameters. C1 designates the message priority from distress to urgent, safety, and routine. MSI messages will always be at least at the safety level. C2 is the service code or type of message (for example, long range NAVAREA warning or coastal NAVTEX warning). It also tells the receiver the length of the address (the C3 code) it will need to decode. C3 is the address code. It can be the two digit code for the NAVAREA number for instance, or a 10 digit number to indicate a circular area for a meteorological warning. C4 is the repetition code which instructs the LES in how long and when to send the message to the NCS for actual broadcast. A six minute echo (repeat) may also be used to ensure that an urgent (unscheduled) message has been received by all ships affected. C5 is a constant and represents a presentation code, International Alphabet number 5, “00”. Broadcasts of MSI in the international SafetyNET service are in English.

# COSPAS/SARSAT System

COSPAS is a Russian acronym for “Space System for Search of Distressed Vessels”; SARSAT signifies “Search And Rescue Satellite-Aided Tracking.” COSPAS-SARSAT is an international satellite-based search and rescue system established by the U.S., Russia, Canada, and France to locate emergency radio beacons transmitting on the frequencies 121.5, 243, and 406 MHz. Since its inception, the COSPAS-SARSAT system (SARSAT satellite only) has contributed to saving over 3000 lives.

The USCG receives data from MRCC stations and SAR Points of Contact (SPOC)

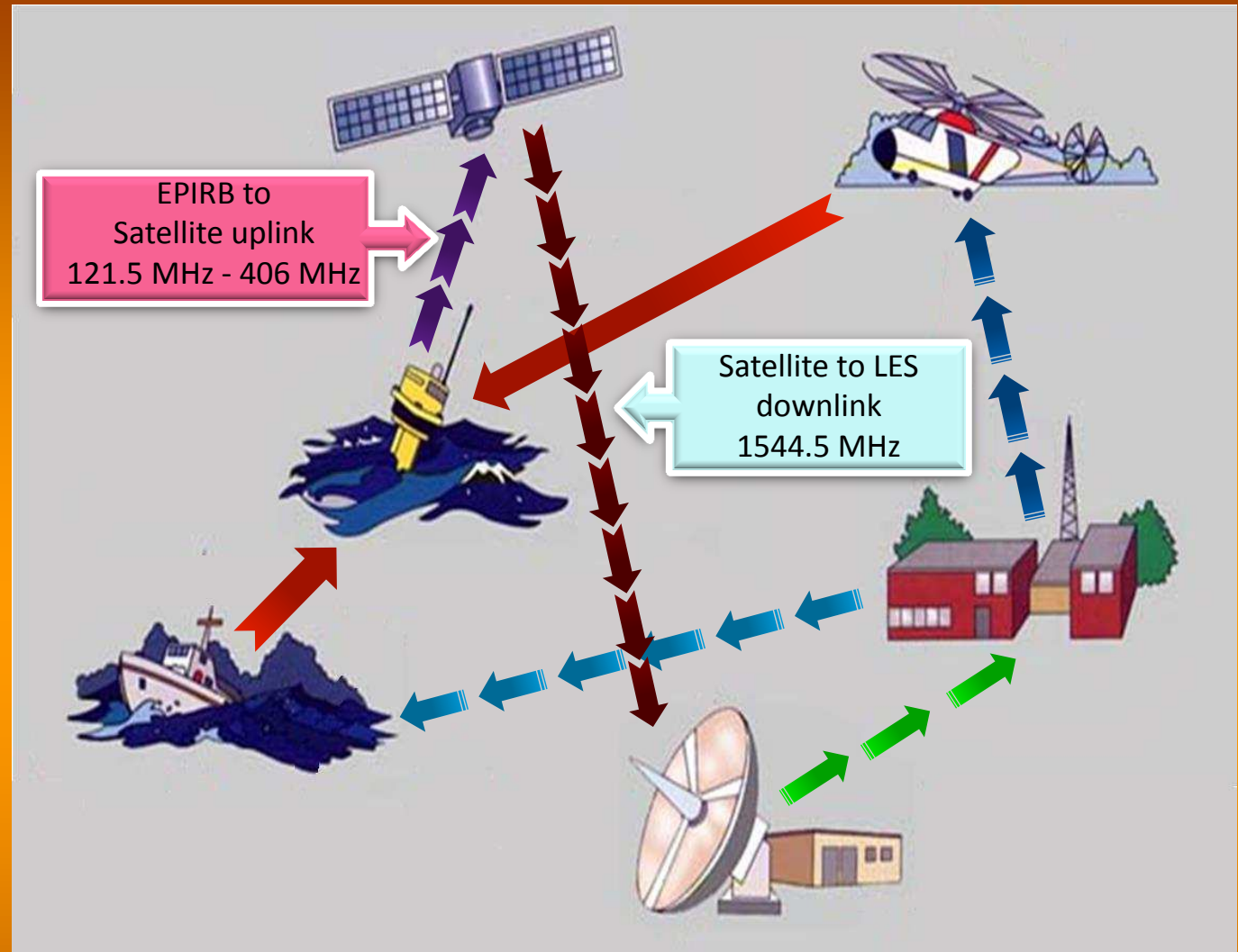


# COSPAS/SARSAT System

The System is composed of: distress radio beacons (ELTs for aviation use, EPIRBs for maritime use, and PLBs for personal use) which transmit signals during distress situations; instruments on board satellites in geostationary and low earth orbits which detect the signals transmitted by distress radio beacons; ground receiving stations, referred to as Local Users Terminals (LUTs), which receive and process the satellite downlink signal to generate distress alerts; and Mission Control Centers (MCCs) which receive alerts produced by LUTs and forward them to Rescue Coordination Centers (RCCs), Search and Rescue Points Of Contacts (SPOCs) or other MCCs.



# COSPAS/SARSAT



Capabilities in locating 3 types of beacons

Type of Distress Beacons		
● AIRBORNE	● Emergency Locator Transmitter	● ELT
● MARITIME	● Emergency Positioning Radio Beacon	● EPIRB
● LAND	● Personal Locator Beacon	● PLB

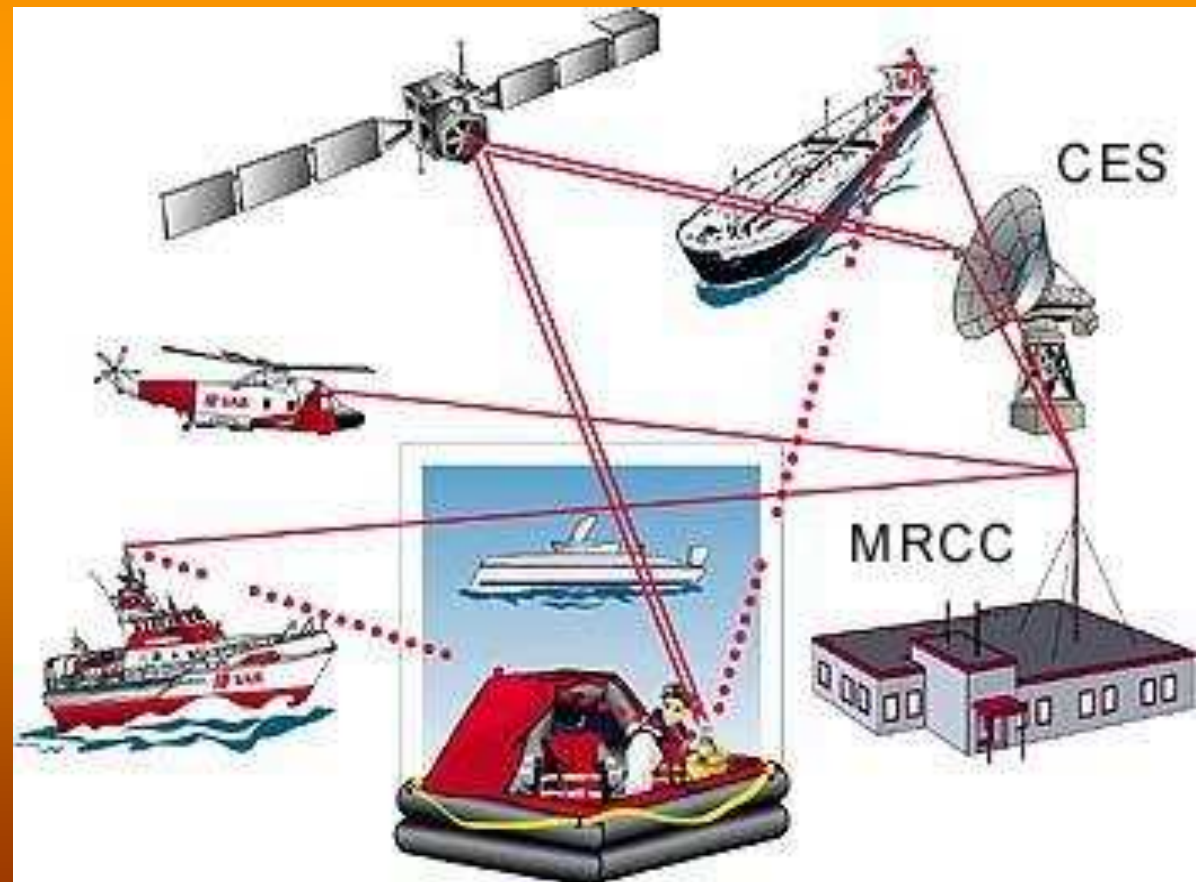
# COSPAS/SARSAT System Participants

<i>Country</i>	<i>Location</i>	<i>Designator</i>	<i>Status</i>
Australia	Canberra	AUMCC	In Operation
Brazil	San Paulo	BBMCC	Under Test
Canada	Trenton	CMCC	In Operation
Chile	Santiago	CHMCC	Under Test
France	Toulouse	FMCC	In Operation
Hong Kong	Hong Kong	HKMCC	In Operation
India	Bangalore	INMCC	In Operation
Indonesia	Jakarta	IONCC	Under Test
ITDC	Taipei	TAMCC	TBD
Japan	Tokyo	JAMCC	In Operation
New Zealand			In Operation
Norway	Bodo	NMCC	In Operation
Pakistan	Lahore	PAMCC	—
Singapore	Singapore	SIMCC	—
Spain	Maspalomas	SPMCC	In Operation
Russian Federation	Moscow	CMC	In Operation
United Kingdom	Plymouth	UKMCC	In Operation
United States	Suitland	USMCC	In Operation

# Operation of COSPAS/SARSAT System

For MF (i.e. 2182 kHz), the EPIRB signal consists of either (1) a keyed emission modulated by a tone of 1280 Hz to 1320 Hz with alternating periods of emission and silence of 1 to 1.2 seconds each; or (2) the radiotelephone alarm signal followed by Morse code B (— • • •) and/or the call sign of the transmitting ship, sent by keying a carrier modulated by a tone of 1300 Hz or 2200 Hz. For VHF (i.e. 121.5 MHz and 243 MHz),

Any vessel or aircraft receiving an EPIRB signal while no distress or urgent traffic is being passed shall initiate a distress message on the assumption that the EPIRB sending station is unable to transmit a distress message. The keying cycles for MF EPIRB's may be interrupted for speech transmission.





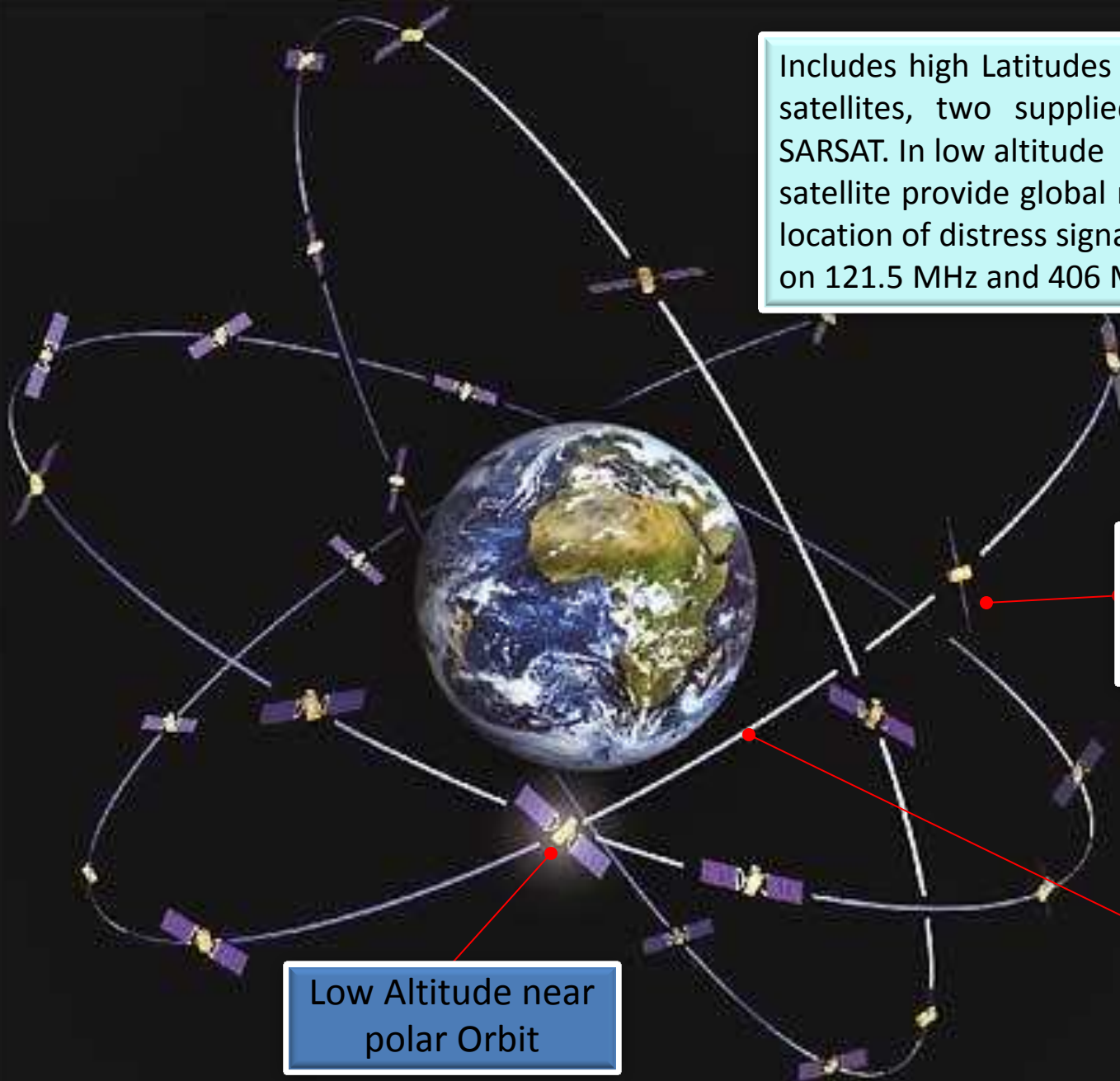
# COSPAS/SARSAT Worldwide Coverage & Principle

Includes high Latitudes and poles. It consist of four satellites, two supplied by COSPAS and two by SARSAT. In low altitude near polar satellite orbit. The satellite provide global monitoring for detection and location of distress signals from beacons transmitting on 121.5 MHz and 406 MHz and 243 MHz

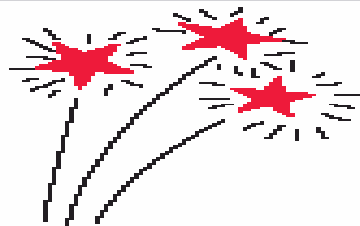
Approximate height –  
1000km  
Speed - about 7km/sec

Low Altitude near  
polar Orbit

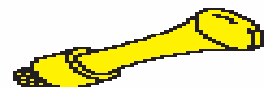
Coverage about  
4000 km



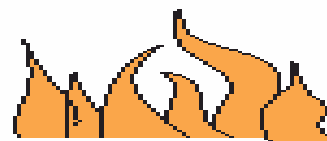
# Distress Signals COLREGS



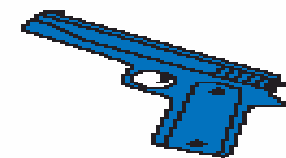
RED STAR SHELLS



FOG HORN  
CONTINUOUS  
SOUNDING



FLAMES ON  
A VESSEL



GUN  
FIRED AT  
INTERVALS OF  
1 MIN.

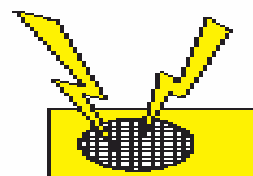


ORANGE  
BACKGROUND  
BLACK BALL  
AND SQUARE

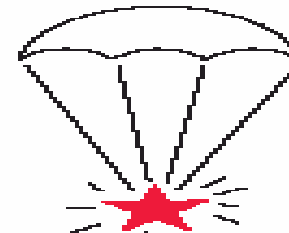


SOS

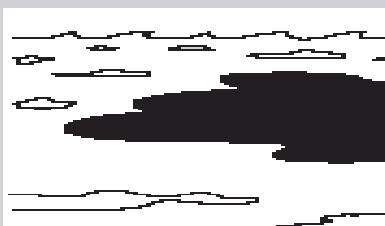
SOS



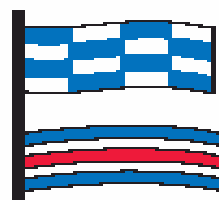
"MAYDAY"  
BY RADIO



PARACHUTE  
RED FLARE



DYE  
MARKER  
(ANY COLOR)



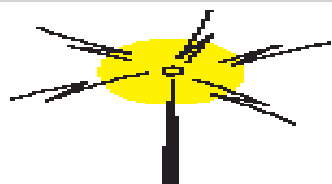
CODE FLAGS  
NOVEMBER  
CHARLIE



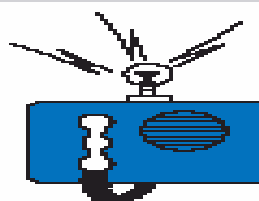
SQUARE FLAG  
AND BALL



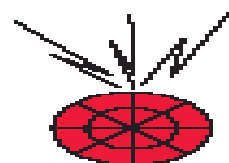
WAVE  
ARMS



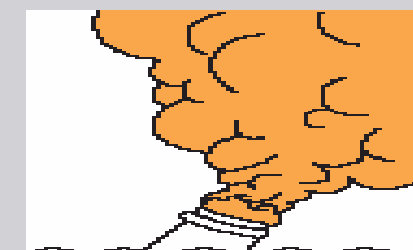
RADIO-  
TELEGRAPH  
ALARM



RADIO-  
TELEPHONE  
ALARM



POSITION  
INDICATING  
RADIO  
BEACON



SMOKE

# DISTRESS SIGNALS

- a signal made by radiotelegraphy or by any signalling method consisting of the group SOS in the Morse code. Or consisting of the spoken word MAYDAY or a 2 tone radio telephone alarm signal.

Not mandatory anymore

- approved signals transmitted by radio communication system
- the International code Signal of distress by the flag “N” and “C”



# DISTRESS SIGNALS

- A Gun or explosive signal fired at an interval of one minute
- A continuous sounding of any fog signalling apparatus
- A signal consisting of a square flag having above or below it with a ball or anything resembling a ball
- Flames on the vessel as from a burning barrel or drum



# DISTRESS SIGNALS

- Rocket or shell, throwing red stars fired one at a time at short intervals
- A rocket parachute flare or a hand flare showing a red light
- An orange smoke signal



# DISTRESS SIGNALS

- Slowly and repeatedly raising and lowering outstretched arm to each side



# INTERNATIONAL CODE OF SIGNALS

Attention is drawn to the relevant sections of the International code of Signals, the merchant Ship Search and Rescue Manual and the following signals:

- A piece of orange-coloured canvass with either a black square and circle or another appropriate symbol. (for identification from the air)
- A dye marker
- A non official but old method of declaring distress is to tie a knot in the national flag



# GMDSS – Search and Rescue (SAR)

A search is "an operation normally coordinated by a Rescue Coordination Center (RCC) or rescue sub-center, using available personnel and facilities to locate persons in distress" and rescue is "an operation to retrieve persons in distress, provide for their initial medical or other needs, and deliver them to a place of safety"



One of the world's earliest well documented SAR efforts ensued following the 1656 wreck of the Dutch merchant ship *Vergulde Draeck* off the west coast of Australia. Survivors sent for help, and in response three separate SAR missions were conducted, without success. In 1983, Korean Air Lines Flight 007 with 269 occupants was shot down by a Soviet aircraft near Sakhalin. The Soviets sent SAR helicopters and boats to Soviet waters, while a search and rescue operation was initiated by U.S., South Korean, and Japanese ships and aircraft in international waters, but no survivors were found.

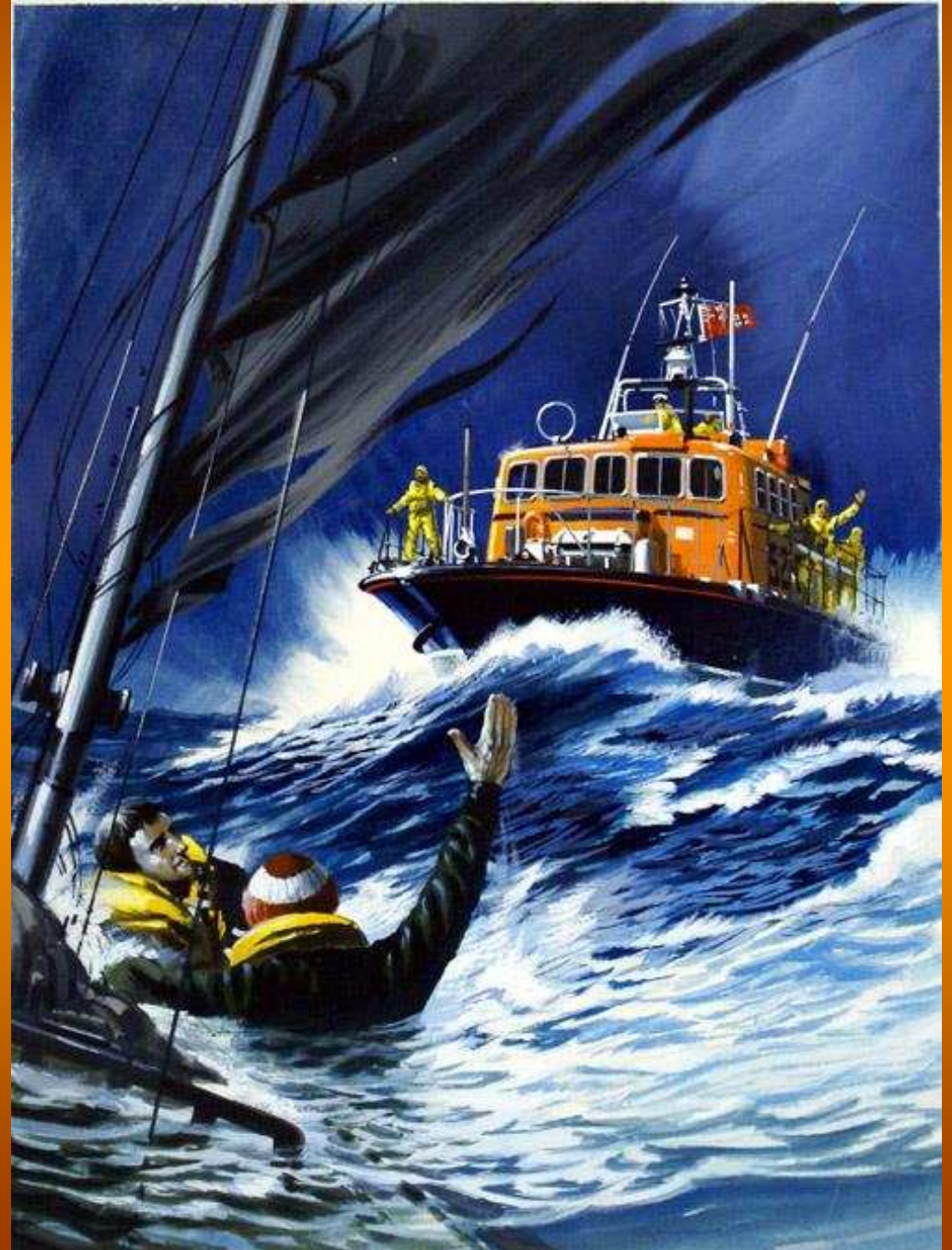
Air-sea rescue (ASR) refers to the combined use of aircraft (such as flyin boats, float planes, amphibious helicopters and non-amphibious helicopters equipped with hoists) and surface vessels to search for and recover survivors of aircraft downed at sea as well as sailors and passengers of sea vessels in distress



# GMDSS – Search and Rescue (SAR)

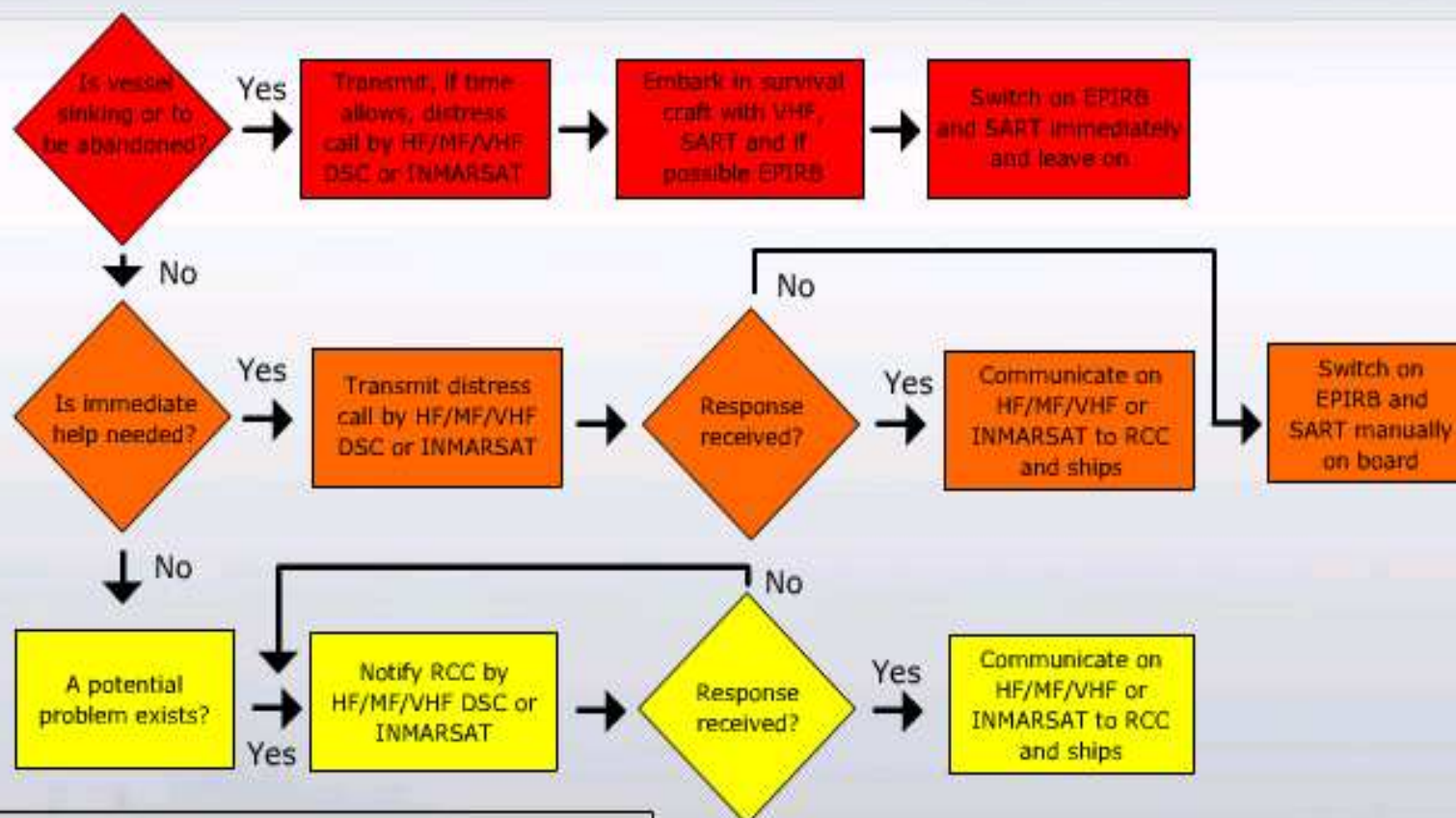
**Search and rescue (SAR)** is the search for and provision of aid to people who are in distress or imminent danger.

Air-sea rescue (ASR) refers to the combined use of aircraft (such as flying boats, floatplanes, amphibious helicopters and non-amphibious helicopters equipped with hoists) and surface vessels to search for and recover survivors of aircraft downed at sea as well as sailors and passengers of sea vessels in distress



# IMO GMDSS operating Guidance for Masters or ships in Distress Situation

## GMDSS OPERATING GUIDANCE FOR MASTERS OF SHIPS IN DISTRESS SITUATIONS



### RADIO DISTRESS COMMUNICATIONS

	Digital selective calling (DSC)	Radio telephone	Radio telex
VHF	Channel 70	Channel 16	
MF	2187.5 kHz	2182 kHz	2174.5 kHz
HF4	4207.5 kHz	4125 kHz	4177.5 kHz
HF6	6312 kHz	6215 kHz	6268 kHz
HF 8	8414.5 kHz	8291 kHz	8376.5 kHz
HF12	12577 kHz	12290 kHz	12520 kHz
HF16	16804.5 kHz	16420 kHz	16695 kHz

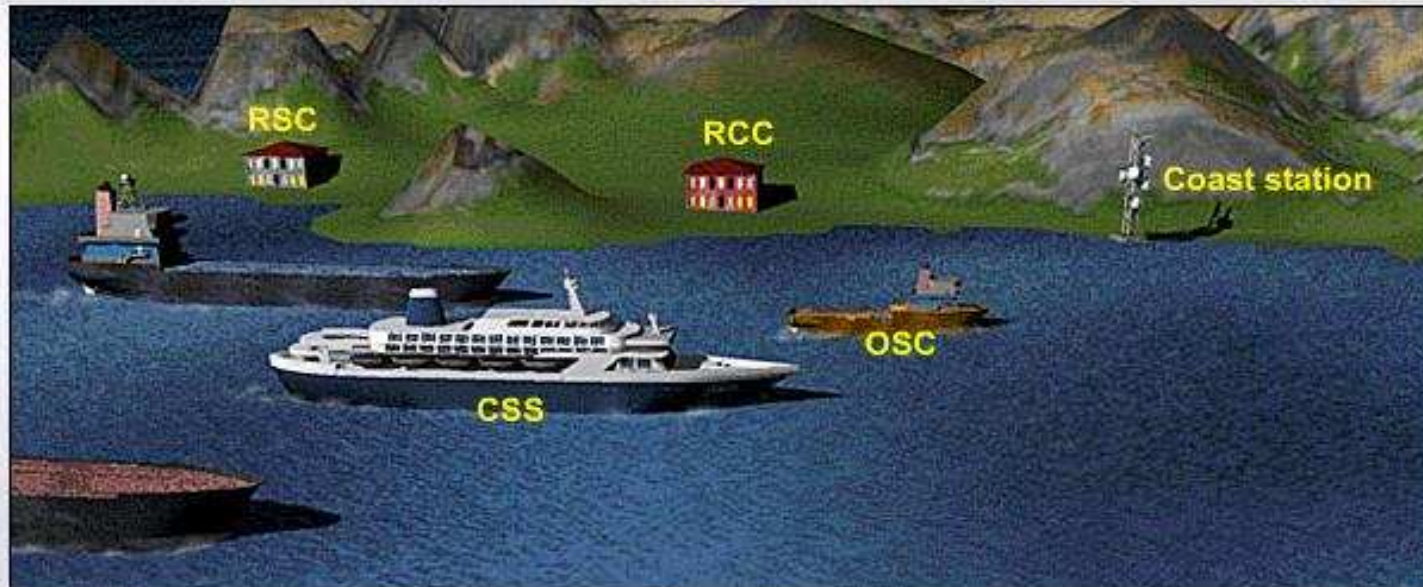
1. EPIRB will float free and activate automatically if it cannot be taken into survival craft.

2. Where necessary, ships should use any appropriate means to alert other ships.

3. Nothing above is intended to preclude the use of any and all available means of distress alerting.

# Search and Rescue (SAR)

A search and rescue unit will be coordinated in order to get a efficient activities going as soon as possible. It is composed of the following



RCC – Rescue Coordination Centre. A unit responsible for promoting efficient organisation and for coordinating the operations within its region.

RSC – Rescue Sub Centre. A unit subordinate to a Rescue Coordination Centre, established to complement the RCC within a smaller region.

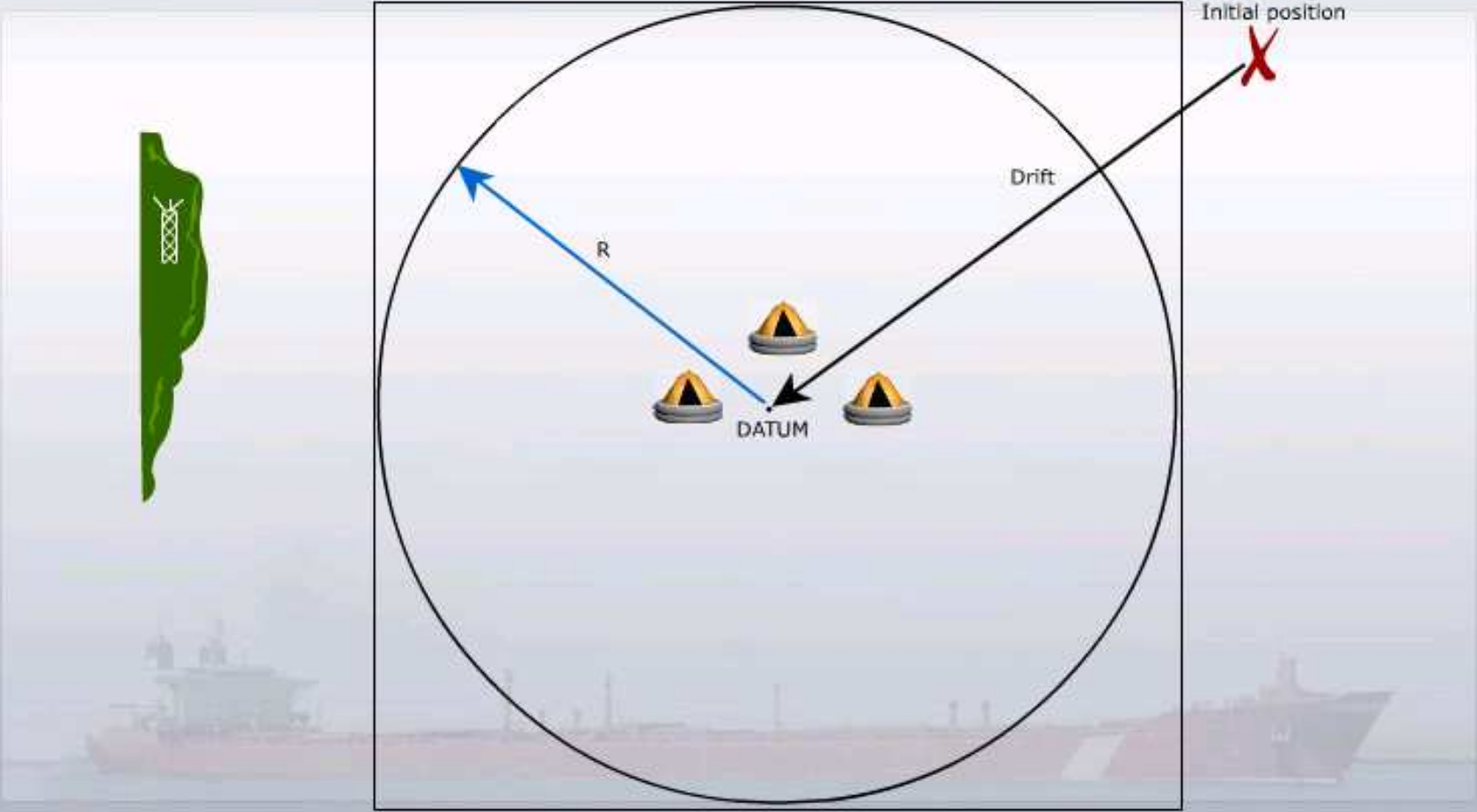
OSC – On Scene Commander. The special trained commander of a rescue unit designated to coordinate search and rescue operations.

CSS – Coordinated Surface Search. An ordinary ship other than a rescue unit designated to coordinate surface search and rescue operations. This might be you.

Coast Station – The coast station is the communications link between units at sea and the Rescue Coordination Centre. This could also be the Coast Earth Station for satellite communications.

# Search Patterns

When you are entering a search area you are to start at searching in a specific pattern

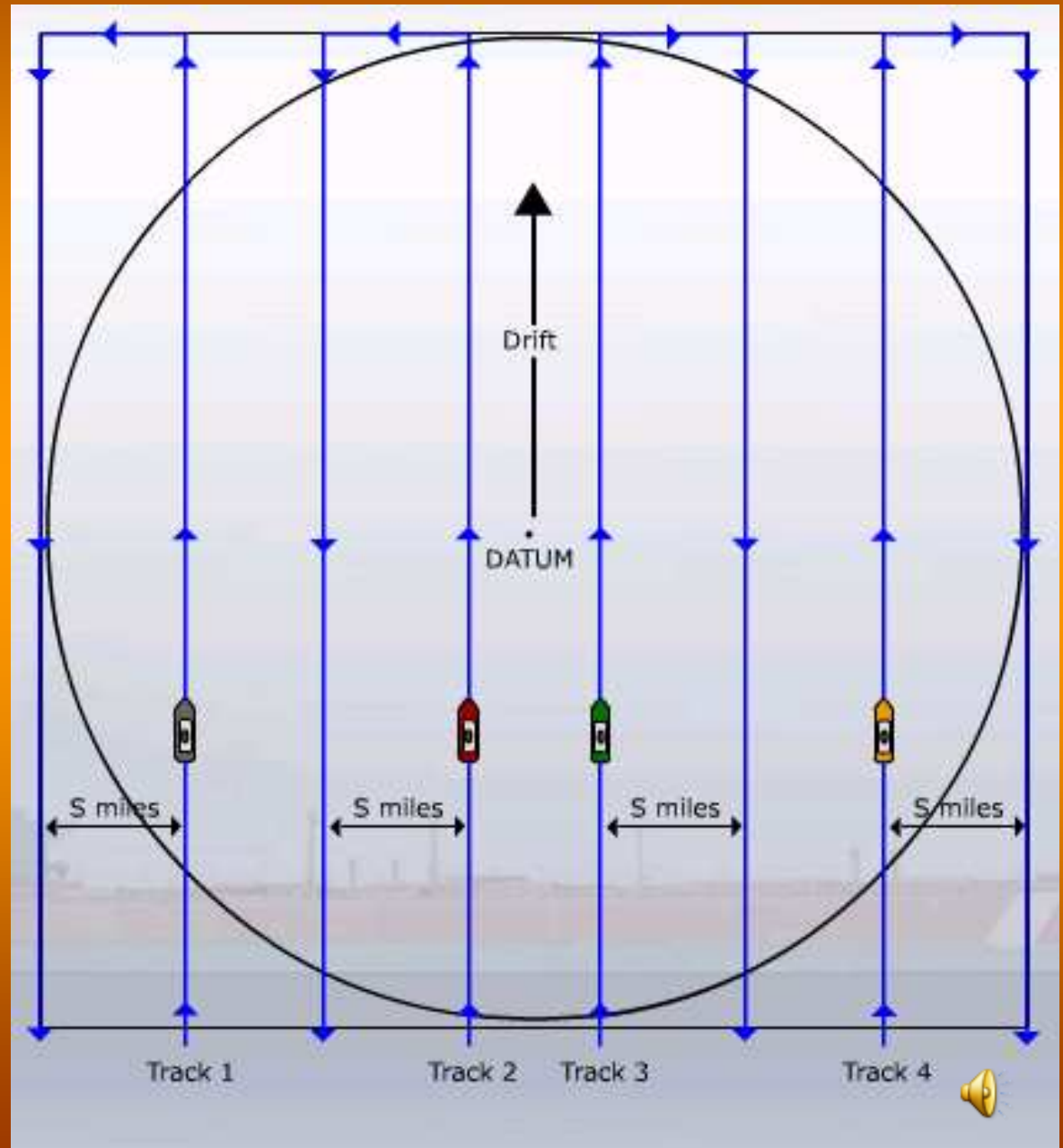


Datum is the point where the life rafts are most likely to have drifted to.

Use  $R=10$  miles for initial search area.

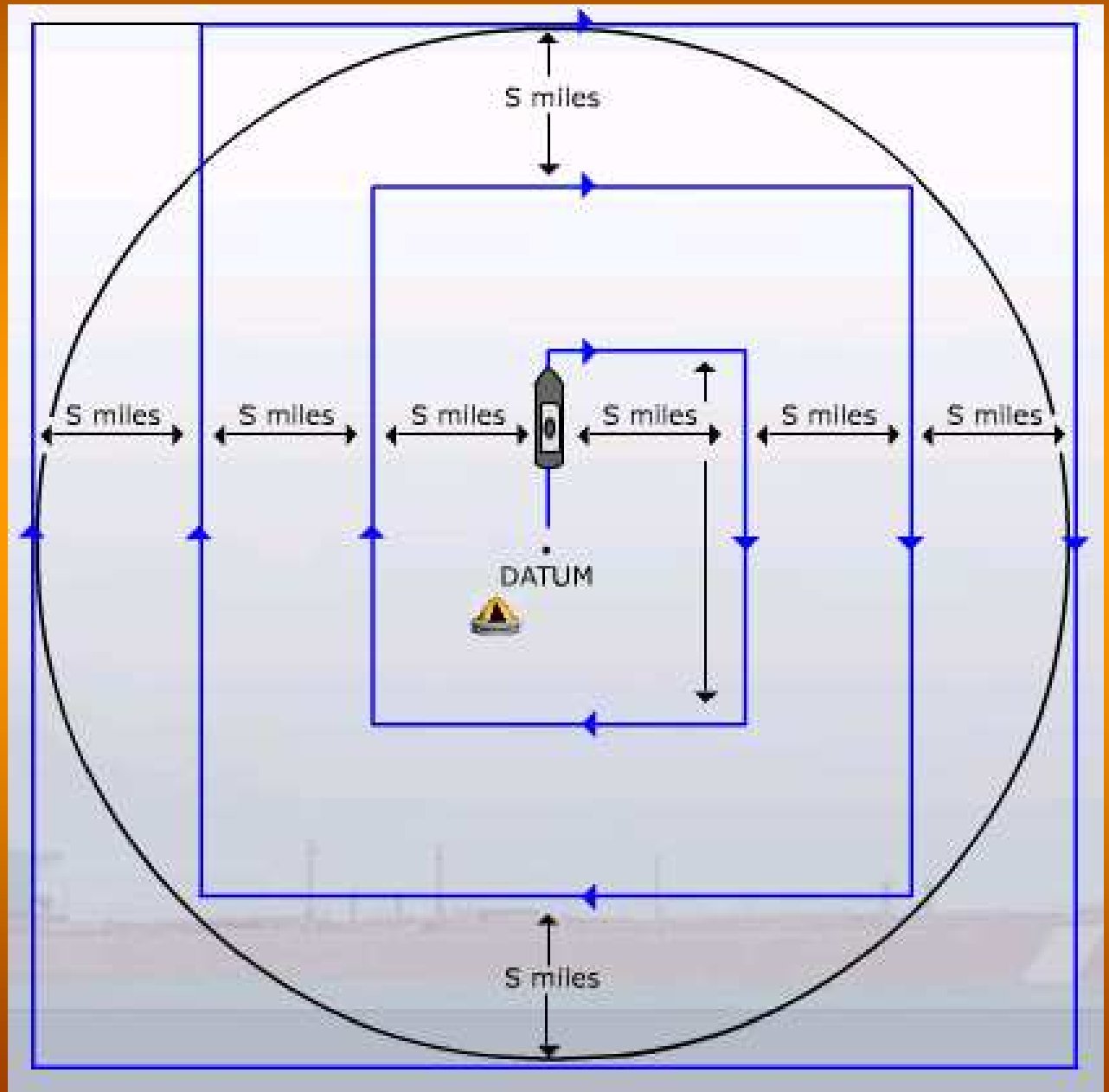
# Parallel Search Patterns

This is the first pattern that is followed for undertaking a search operation. Track line search pattern can be undertaken with one or more vessels. The reason for adopting this method is the assumption that the object to be searched is in the near vicinity and along the 'track'. It is also used when the search area is large and only an approximate location is necessary. Following this pattern ensures uniform coverage. The main vessel/s starts the search parallel to each other as shown in the diagram above. After a little distance, the vessels turn away from each other at 90 degrees. Then after a short distance they again take a right turn and move the entire length parallel to each other. The spacing between two track lines is referred to as 'track spacing', or to put in simple words the distance between two parallel lines is termed as 'track spacing'



# Expanding Square Pattern

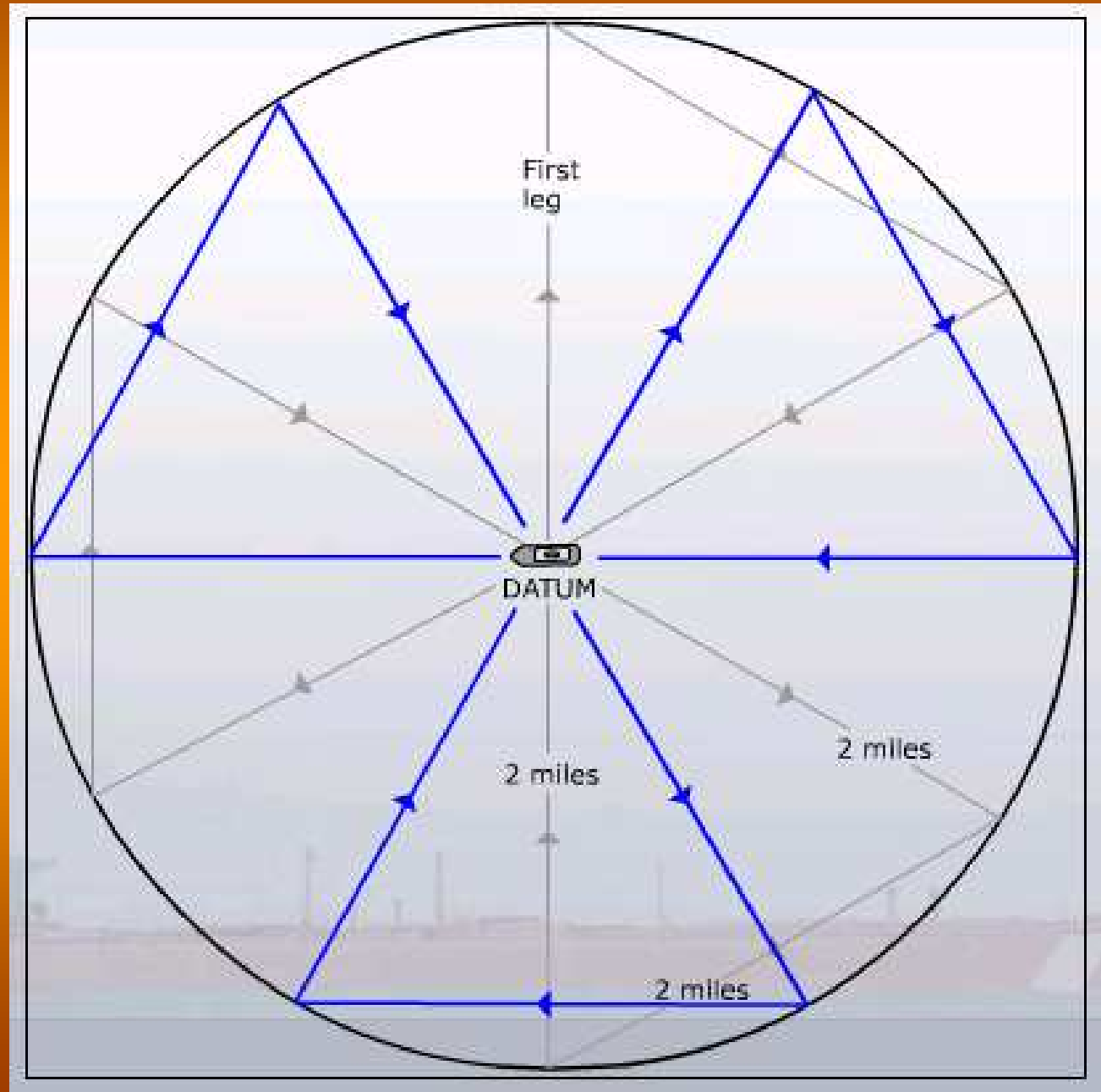
This pattern can be undertaken by surface vessels or even aircraft search units. Starting at the probable location of the target, the search vessels expand outward in concentric squares.



# Sector Search Patterns

The sector search is employed when the position of the body is known accurately and the search has to be carried over a small area. It is normally carried out in the area, where the casualty or the object has been sighted. The probability of detection of the object is high close to datum and spreads the search over.

On drawing the pattern it comes like the spokes of a wheel. The advantage is the search vessels cross the datum a number of times. The first step is to determine the drift and carry out the operations in that direction. The distance between two search legs is 120 degrees and it takes three searches to complete one circle.



# Search Patterns

---





# Search Patterns

---



# Word Meanings and Acronyms

---

- **GMDSS** – Global Maritime Distress Safety
- **NAVTEX** - is a maritime radio warning system consisting of a series of coast stations transmitting radio teletype with narrow-band direct printing
- **INMARSAT** - International Maritime Satellite Organization
- **COSPAS** - COsmicheskaya Sistyema Poiska Avariynch Sudov is a Russian acronym for “Space System for Search of Distressed Vessels”
- **SARSAT** - Search And Rescue Satellite-Aided Tracking
- **GEOSAR** - Geostationary Earth Orbit Search and Rescue
- **LEOSAR** - Low-Earth Orbiting Search and Rescue
- **SART** – Search and Rescue Transponder
- **EPIRB** – Emergency Positioning Indicating Radio Beacon
- **ELT** – Emergency Locator Transmitter
- **PLB** - Personal Locator Beacon
- **LUT** – Local User’s Terminal
- **MCC** - Mission Control Centers
- **RCC** - Rescue Coordination Centers
- **SPOC** - Search and Rescue Points of Contacts
- **EGC** – Enhanced Group Call

# Word Meanings and Acronyms

---

- **CES** - Coast Earth Stations
- **NCS** - Network Coordinating Stations
- **NOC** - Network Operations Center
- **SES** - Ship Earth Station
- **SCC** – Satellite Control Center
- **MSI** – Maritime Safety Information
- **MES** - Mobile Earth Station
- **GES** - Ground Earth Station
- **CES** - Coast earth Station
- **LES** - Land Earth Station
- **NSC** - Network Coordination Station
- **DSC** – Digital Selective Calling
- **VHF** - Very High Frequency
- **HF** – High Frequency
- **MF** – Medium Frequency
- **IMSO** - International Mobile Satellite Organization
- **ESA** - European Space Agency
- **NOAA** – National Oceanic and Atmospheric Administration
- **SSAS** - or Ship Security Alert System

# Word Meanings and Acronyms

---

- **AIS** – Automatic Identification System
- **INTELSAT** - International Telecommunications Satellite Organization
- **MMSI** - Maritime Mobile Service Identity
- **NBDP** - Narrow Band Direct Printing
- **DISTRESS SIGNAL** – are NC of the international code: the ensign Union down emergency; minute guns; continued blast of whistle; various pyrotechnics or a burning tar barrel at night, SOS by radio also MAYDAY by voice radio.
- **MAYDAY** – the distress call of voice radio, being from the French “m’aider”(help me)
- **MORSE** – to signal with a Morse lamp.
- **MORSE CODE** – a system of dots and dashes which represents letters and numbers
- **MORSE LAMP** – an instrument at the bridge used to signal by flashlight.