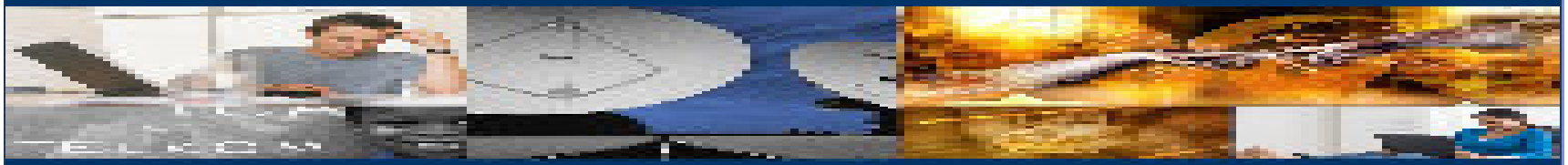
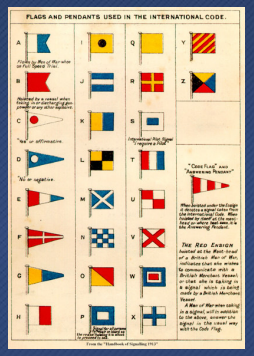


Global Maritime Distress and Safety System (GMDSS) in the South African Context.

Ashwin Budhal
Network Centre Operations - Maritime
Telkom SA Limited
November 2006

Beginning of GMDSS

For hundreds of years many ships of different types sailed the seas and their safety depended upon their own skills. Signaling methods were by flag and letters passed from ship to ship.



Distress Alerting was by firing a gun, or pyrotechnics, and only succeeded when other ships were in sight or when close to inhabited land.

Early Evolution of Maritime Radio

- 1895 - The invention of Radio (Spark Transmitters and Morse)
- 1899 - The first incident of Radio being used to report a Distress at Sea !! A Lightship equipped by Marconi reported the grounding of the steamer ELBE.
- 1910 - The first SA station on the BLUFF in Durban with a 3 kW Spark transmitter for ship/shore communications.
- 1912 - The TITANIC disaster and the saving of 700 lives due to the watch-keeping of the CARPATHIA.
- 1914 - The first International Convention for the Safety of Life at Sea (SOLAS) adopted.

Further developments

- 1929 - Second SOLAS convention with stricter watch-keeping requirements and the advent of the first fully Automatic Alarm system.
- The 1974 SOLAS agreement dealt in detail with Distress and Safety and the first suggestions of using Satellite communications were evolved.
- The 1974 SOLAS Agreement was amended in 1981 and 1984 and finally in 1992 to provide for the Global Maritime Distress and Safety System (GMDSS).

GMDSS Plan

- GMDSS emphasis the ability to alert search and rescue authorities ashore as well as shipping in the area to achieve a rapid response.
- Shore bases authorities now have the primary role of coordinating assistance following a distress alert.
- Worldwide communication coverage of the GMDSS is achieved by a combination of Satellite and terrestrial radio systems.
- Ships equipment is determined by the Ocean Area in which it sails and not by size, type, number of passengers etc.

GMDSS Sea areas

Sea Area A1

Within VHF Range of at least one VHF DSC Coast Station (approx. 30 - 50 Nautical Miles)

Sea Area A2

Within MF (2MHz) Range of at least one MF DSC Coast Station (approx. 150 Miles)

Sea Area A3

Within the Inmarsat area of coverage and outside Area A1 and 2

Sea Area A4

Outside Areas A1, 2 and 3. Comprises mainly high latitude Polar Areas

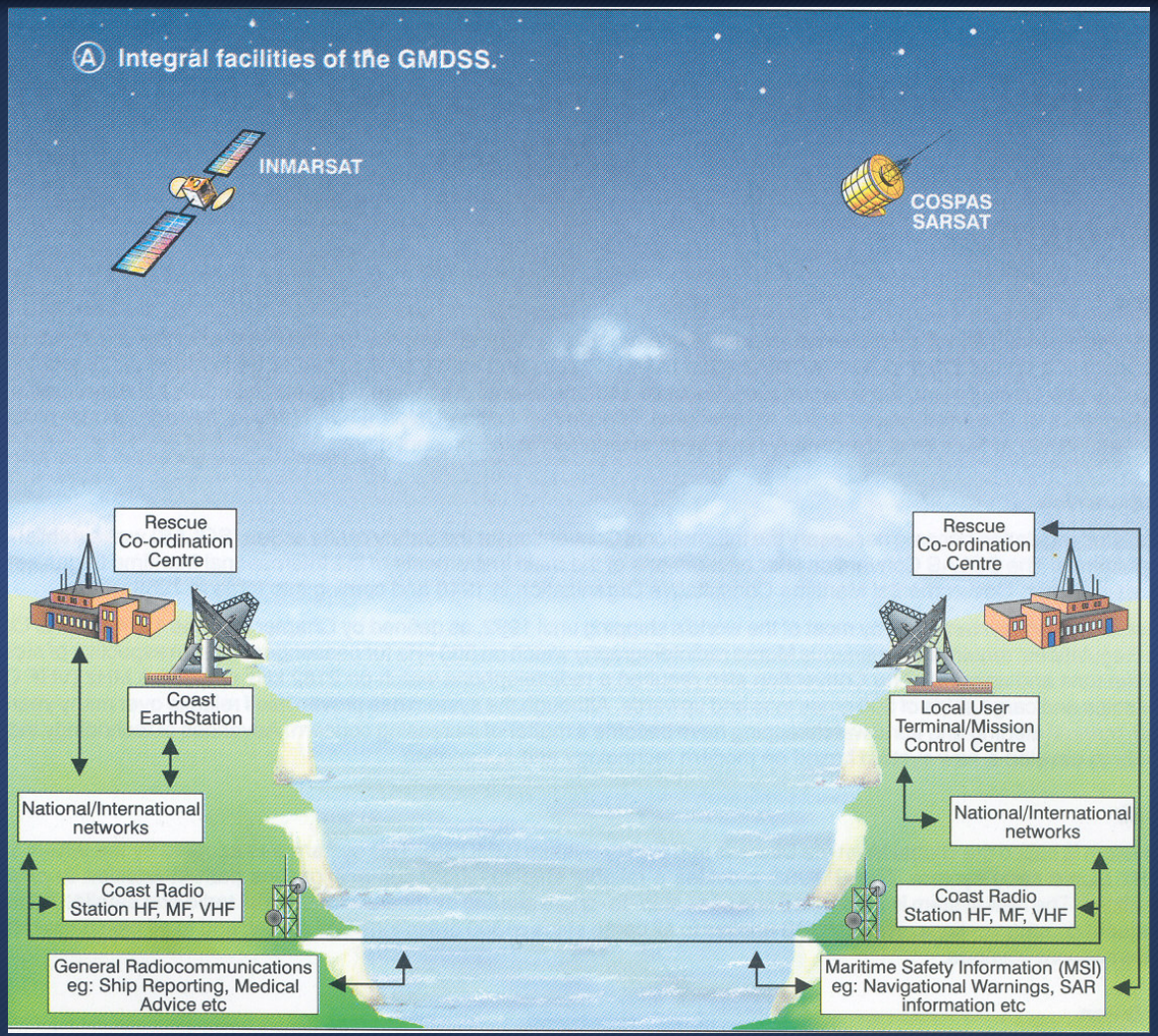
GMDSS features

- Radio watch-keeping is automatic
- Subsequent distress and safety communications are carried out on radiotelephone or radio-telex.
- GMDSS consists of a number of sub systems:
  - Digital Selective calling system – radio based
  - Satellite communications systems
  - Maritime Safety information systems (Navtex and Safetynet)
  - The Emergency Position indication radio beacon system (EPIRB)
  - The Search and Rescue Transponder (SART) system

GMDSS Functional requirements

- Transmission of ship to shore distress alerts by at least two independent means
- Reception of shore to ship distress alerts
- Transmission and reception of:
  - ship to ship distress alerts
  - search and rescue communications
  - on-scene communications
  - signals used for location
  - Maritime safety information
  - general radio-communications to and from the shore
  - bridge to bridge communications

Facilities of GMDSS



Communications system used in GMDSS

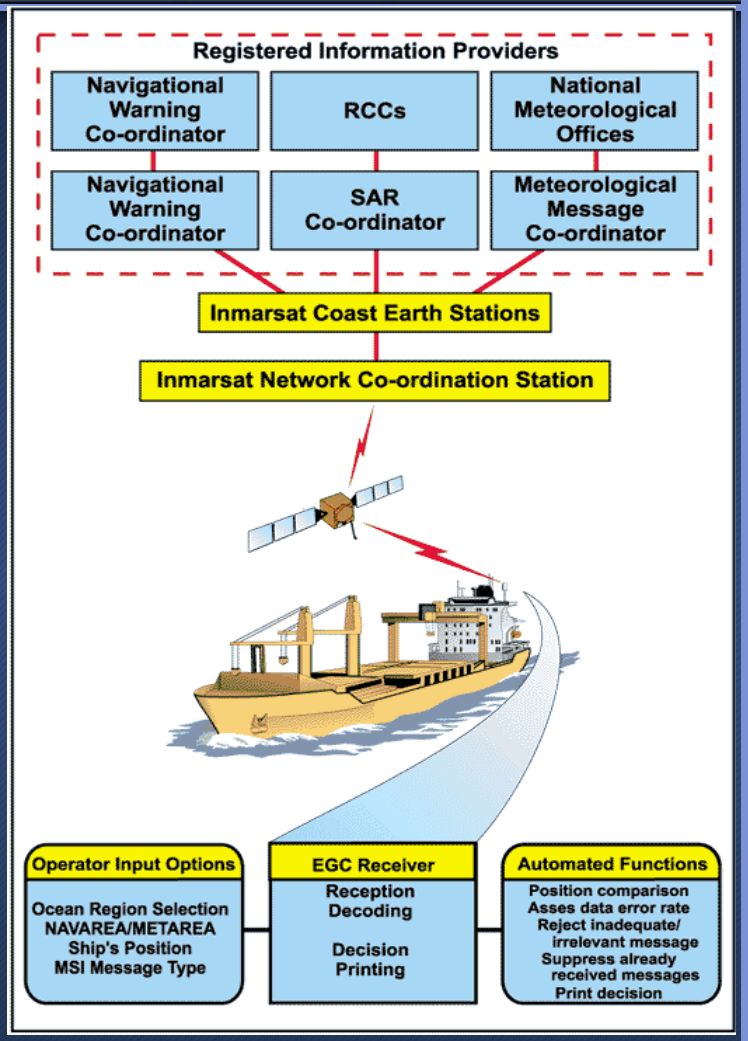
- Terrestrial Radio
  - Long Range – HF Radio
  - Medium Range – MF Radio
  - Short Range – VHF radio
  - Navtex
- Satellite Communications
  - INMARSAT A, B, and C
  - Safety-NET
  - COSPAS SARSAT

What is DSC?

- Digital automatic alerting system that listens for ships in distress on the VHF, MF and HF frequency band and presents the information (position, I.D. of ship and type of distress) to the operator at CRS or RCC.
- DSC Area A1 VHF channel 70 for 30 – 50 miles range
- DSC Area A2 MF 2187.5 KHz for 150 – 250 mile range
- DSC Area A3 HF on the 4, 6, 8, 12 and 16 MHz bands for long range worldwide coverage

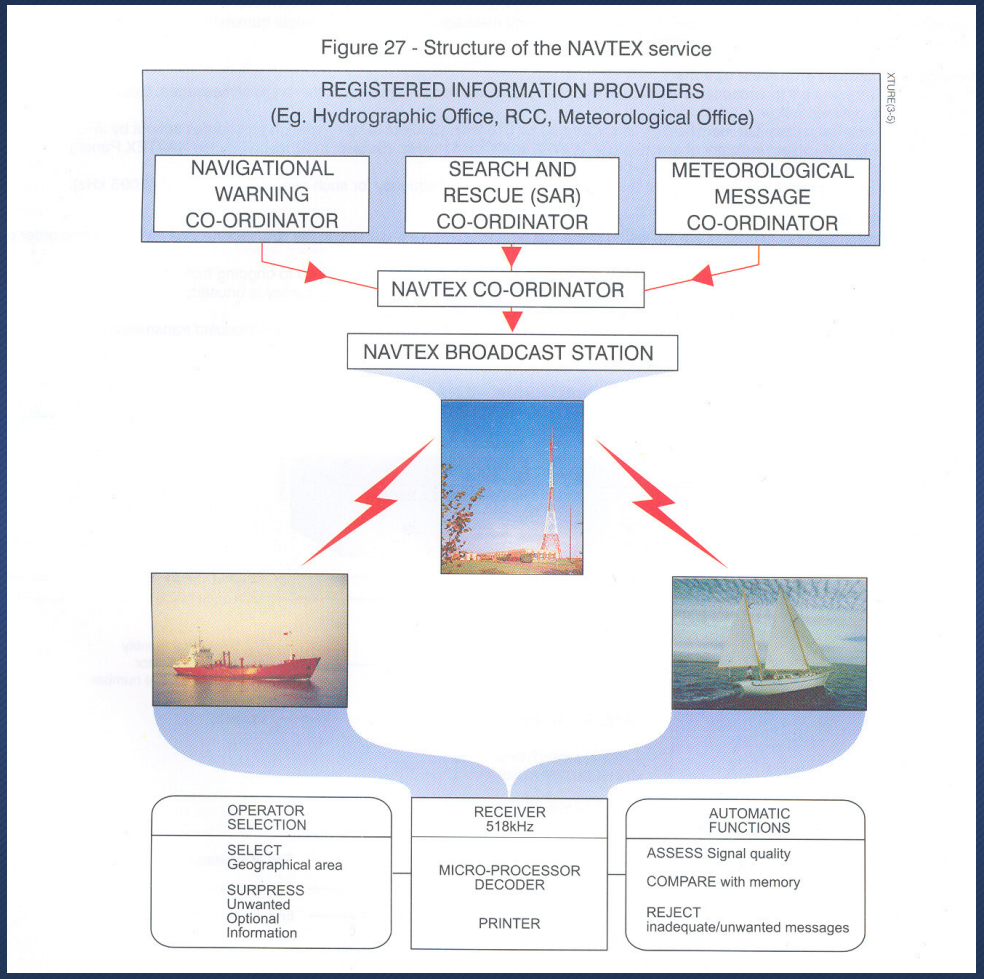
What is SafetyNET

- The daily transmission of Maritime Safety Information to ships using Inmarsat C equipment in the various ocean regions. All ships in the designated areas with the appropriate satellite equipment will receive this information.



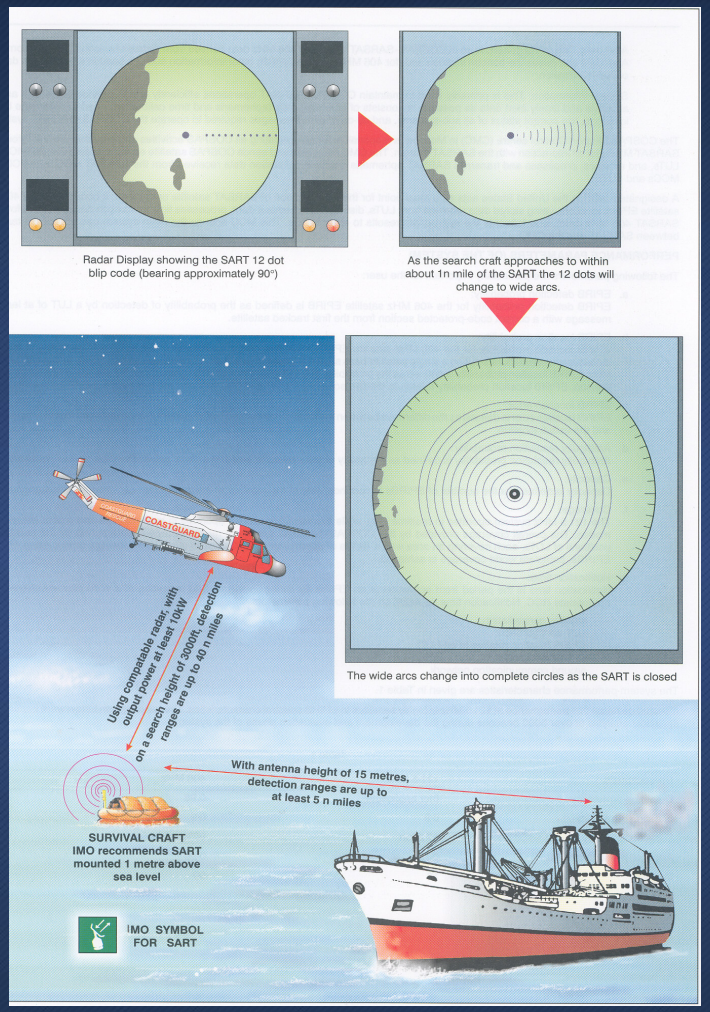
What is Navtex?

The daily transmission of Weather forecasts, Navigation warnings and Safety information, also known as Maritime Safety Information (MSI) to ships on mainly 518Khz using the English language.



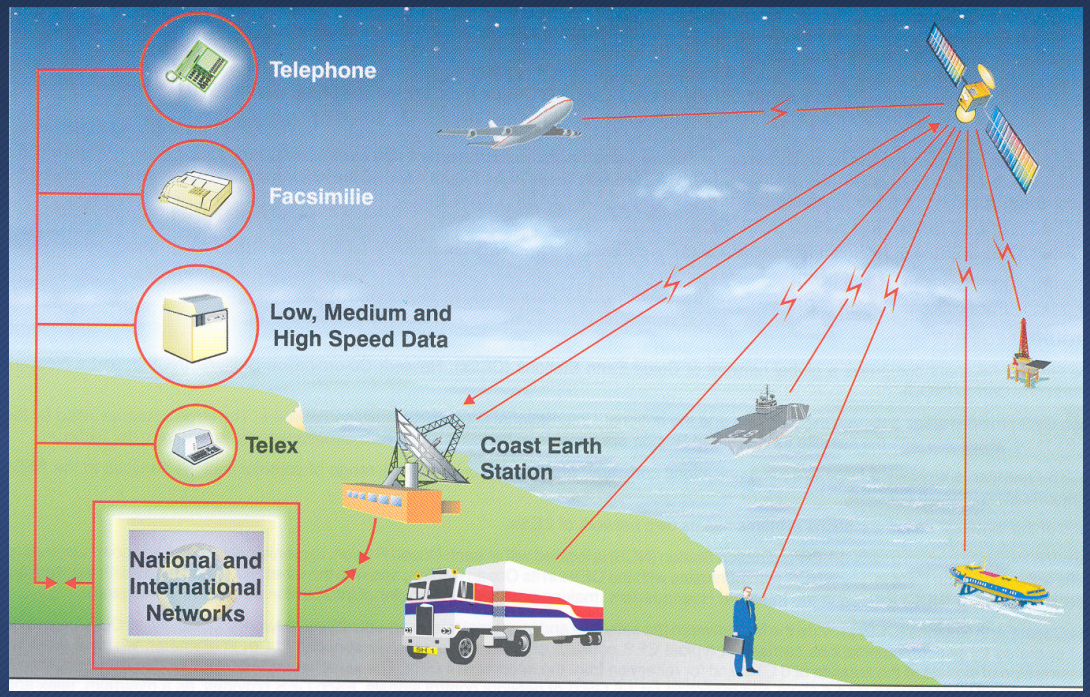
What is a SART?

A search and rescue transponder is the means in GMDSS to locate ships in distress or their survival craft using X band (9 GHz) radar on scene



Distress alerting through INMARSAT

The Inmarsat system provides priority access to satellite channels in emergency situations and provides an alert to the LES personnel.



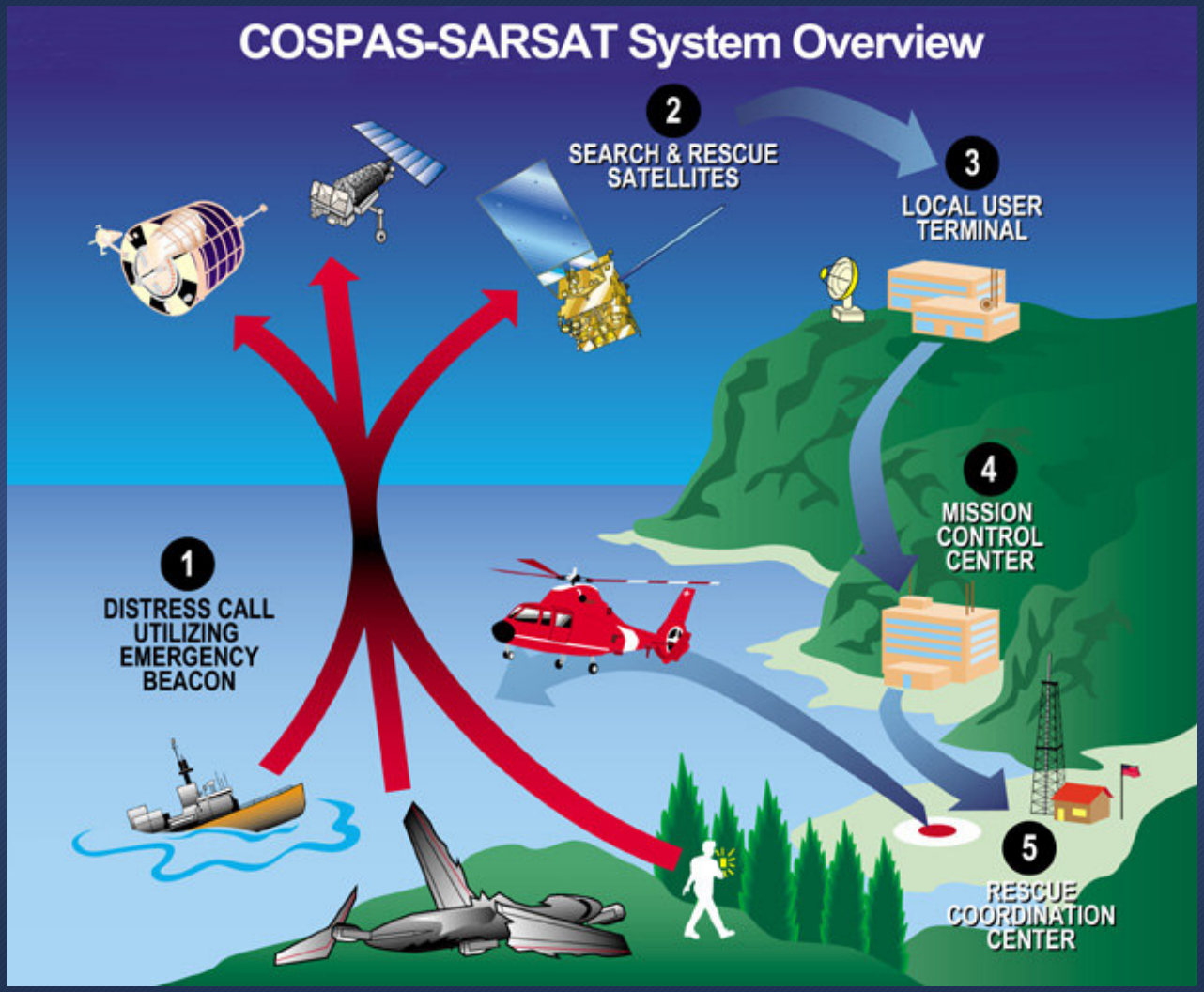
What is COSPAS SARSAT?

- International organization started by USA, France, Canada and USSR and provides, free-of-charge, distress alert and location information to search and rescue authorities anywhere in the world for maritime, aviation and land users in distress.
- Persons rescued world-wide since 1982

  >18800
- Search and Rescue events since 1982

  > 5300
- The system consists of a space segment (satellites), ground segment (Local User terminal or LUT/Mission control centre or MCC) and alerting devices or beacons (EPIRB, ELT, PLB)

Overview


COSPAS-SARSAT System Overview
2
SEARCH & RESCUE SATELLITES
3
LOCAL USER TERMINAL
4
MISSION CONTROL CENTER
1
DISTRESS CALL UTILIZING EMERGENCY BEACON
5
RESCUE COORDINATION CENTER

Beacons

- Manual or Automatic Activation

- 121.5 MHz Analog signal
- Approximately 600,000 world-wide and declining

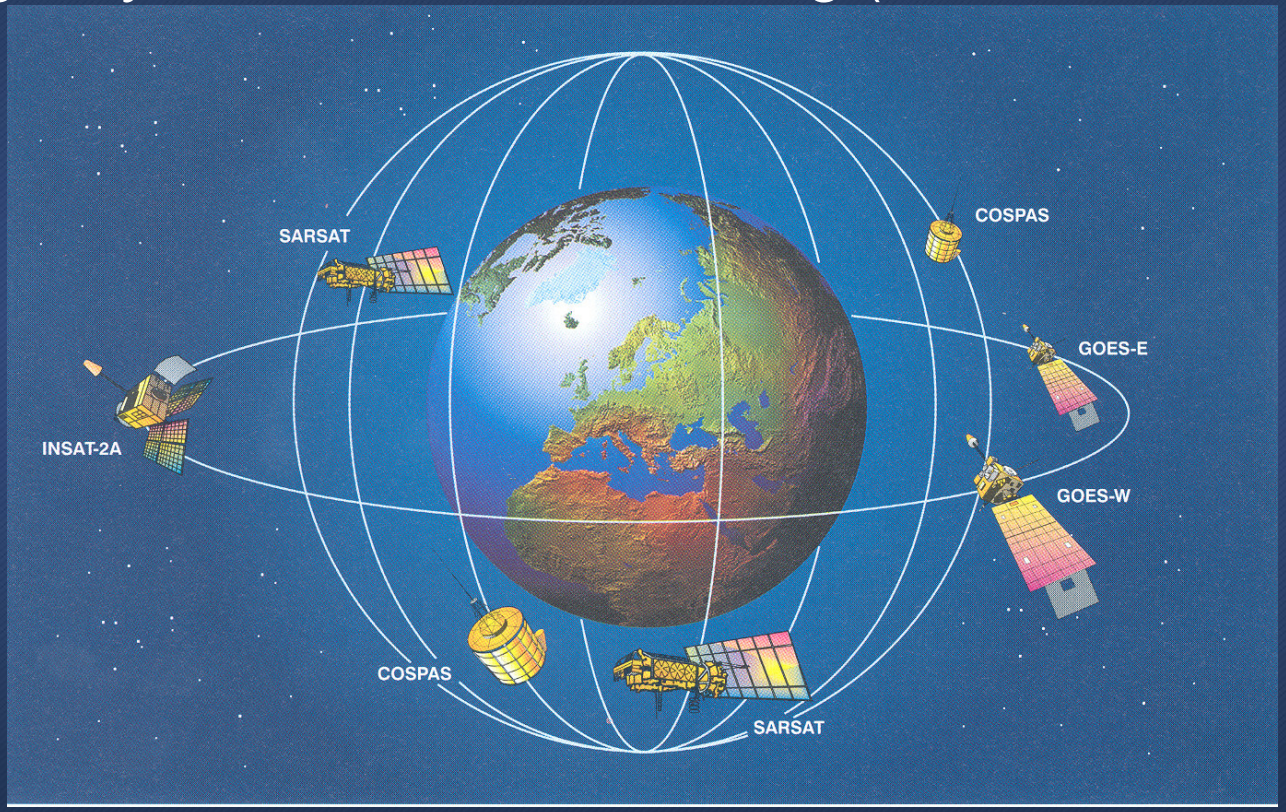
- 406 MHz Digital signal
- Approximately 400,000 world-wide and growing.
- Applications:
- Maritime - Emergency Position-Indicating Radio Beacon (EPIRB)
- Aviation - Emergency Locator Transmitter (ELT)
- Personal/Land - Personal Locator Beacon (PLB)

Statistics end 2004

Satellites

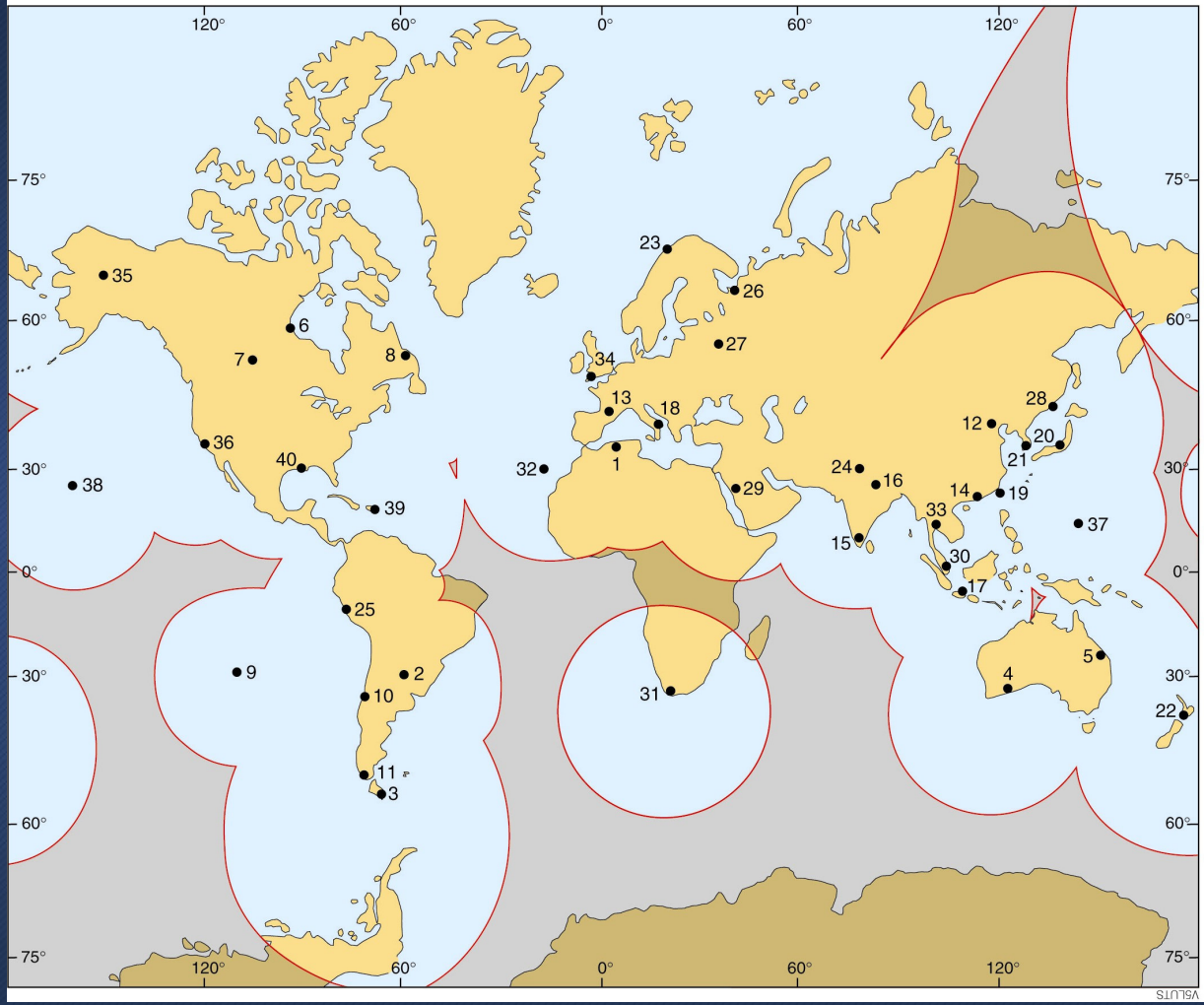
Two types of satellites:

Low-earth orbiting (LEO)/polar orbiting (LEOSAR); geosynchronous earth orbiting (GEO or GEOSAR)



Coverage area

Figure 20 - Satellite Visibility Area of COSPAS-SARSAT Operational LEOSAR Local User Terminals (LEOLUTS)



NOTES

LUTs:

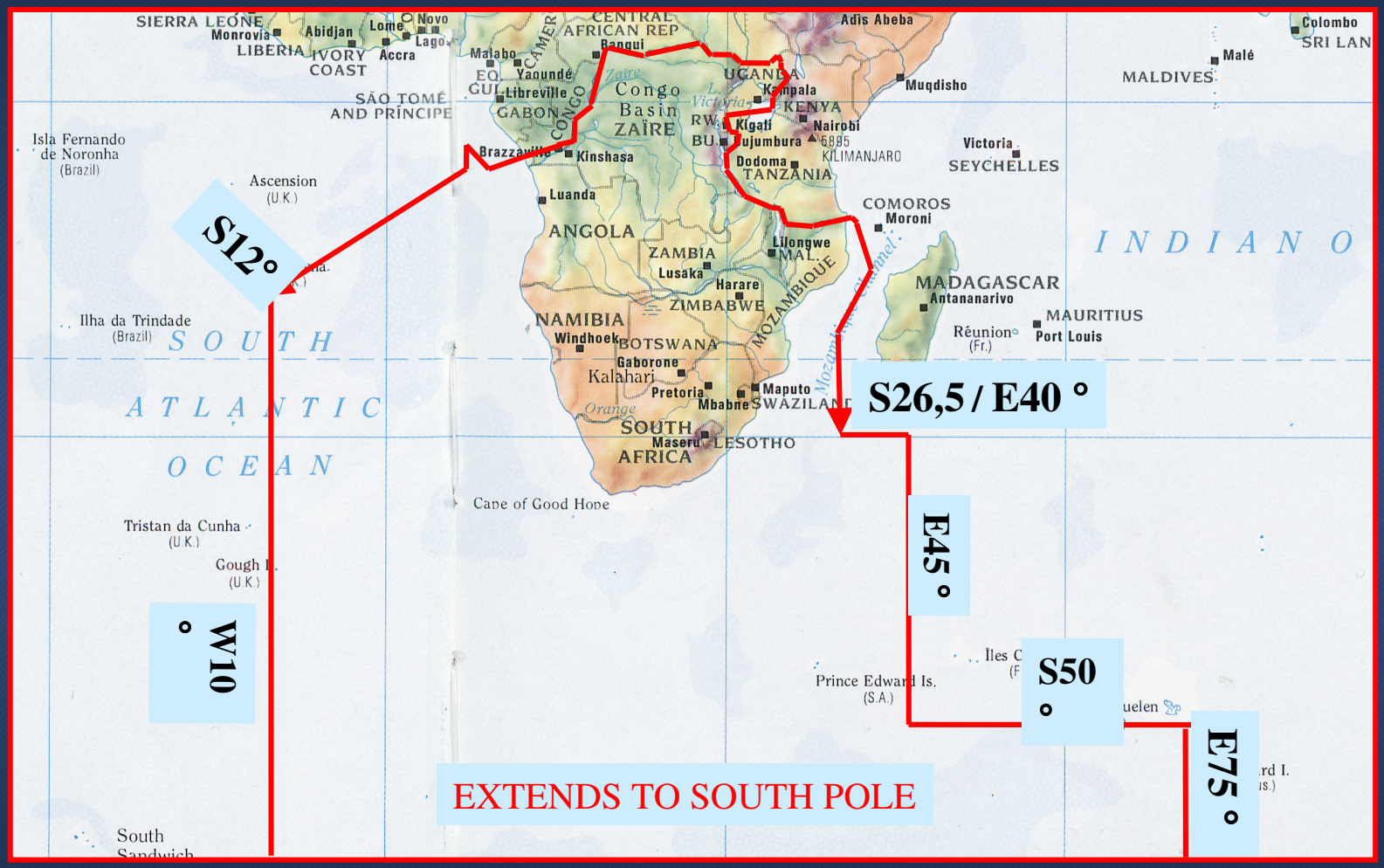
1 Ouargla, Algeria
2 Parana, Argentina
3 Rio Grande, Argentina
4 Albany, Australia
5 Bundaberg, Australia
6 Churchill, Canada
7 Edmonton, Canada
8 Goose Bay, Canada
9 Easter I, Chile
10 Santiago, Chile
11 Punta Arenas, Chile
12 Beijing, China
13 Toulouse, France
14 Hong Kong, China
15 Bangalore, India
16 Lucknow, India
17 Jakarta, Indonesia
18 Bari, Italy
19 Keelŭng, Taiwan
20 Yokohama, Japan
21 Daejŏn, Korea
22 Wellington, NZ
23 Tromsø, Norway
24 Lahore, Pakistan
25 Callao, Peru
26 Arkhangel'sk, Russia
27 Moskva, Russia
28 Nakhodka, Russia
29 Jeddah, Saudi Arabia
30 Singapore
31 Cape Town, South Africa
32 Maspalomas, Spain
33 Bangkok, Thailand
34 Combe Martin, UK
35 Alaska, USA
36 California, USA
37 Guam
38 Hawaii, USA
39 Puerto Rico
40 Texas, USA

KEY:

Blue Area: Coverage for 406 MHz **and** 121·5 MHz EPIRBs

Grey Area: Approximate coverage for 406 MHz EPIRBs only

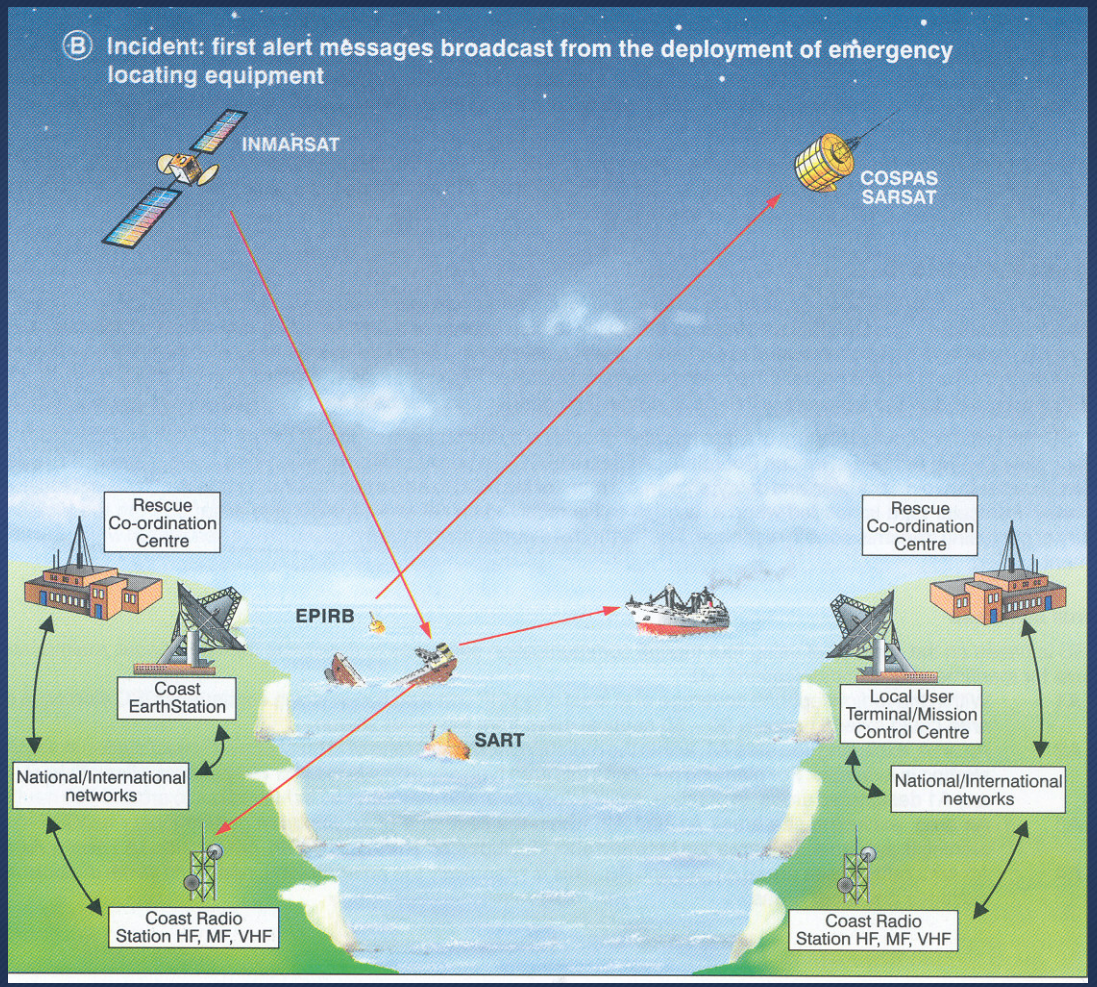
COSPAS SARSAT responsibility area



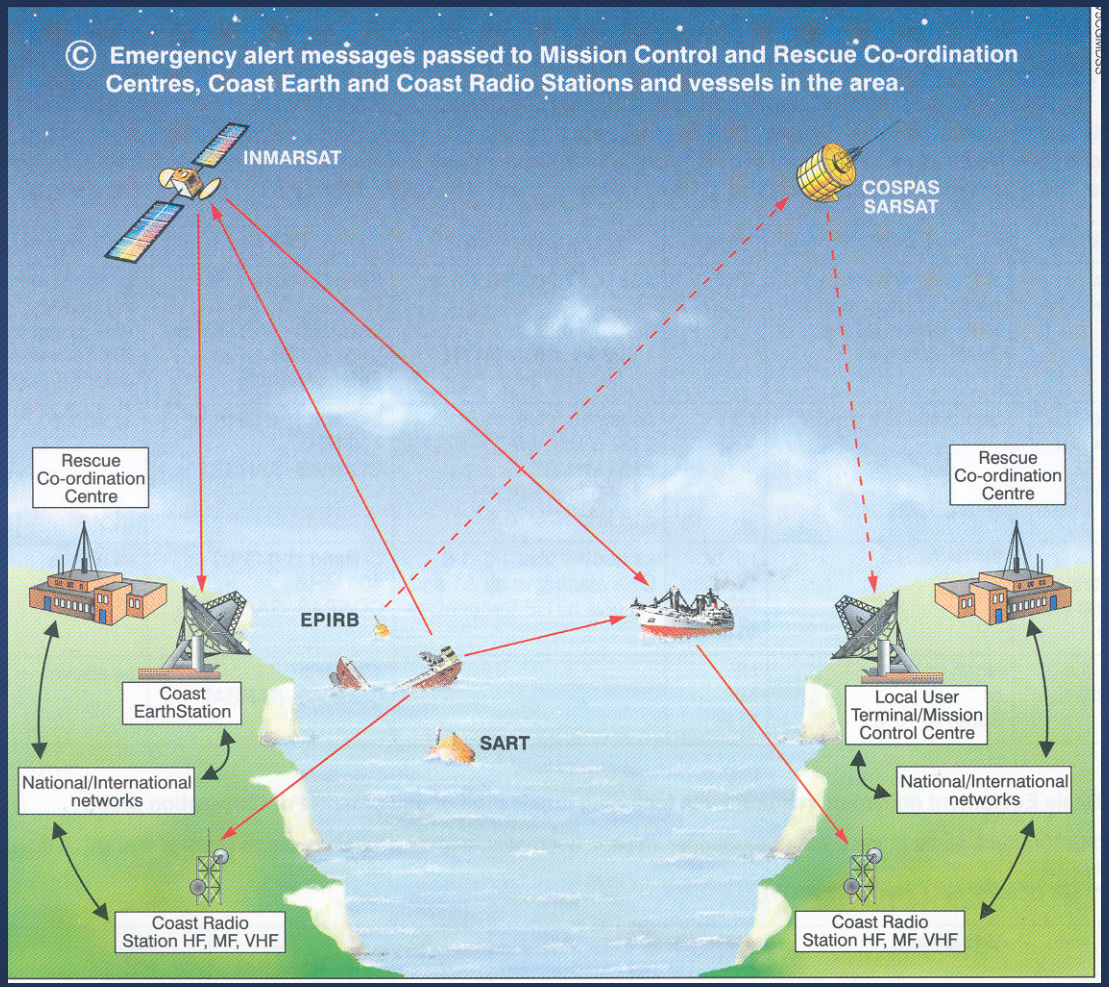
Beacon types

Cospas Sarsat in SA

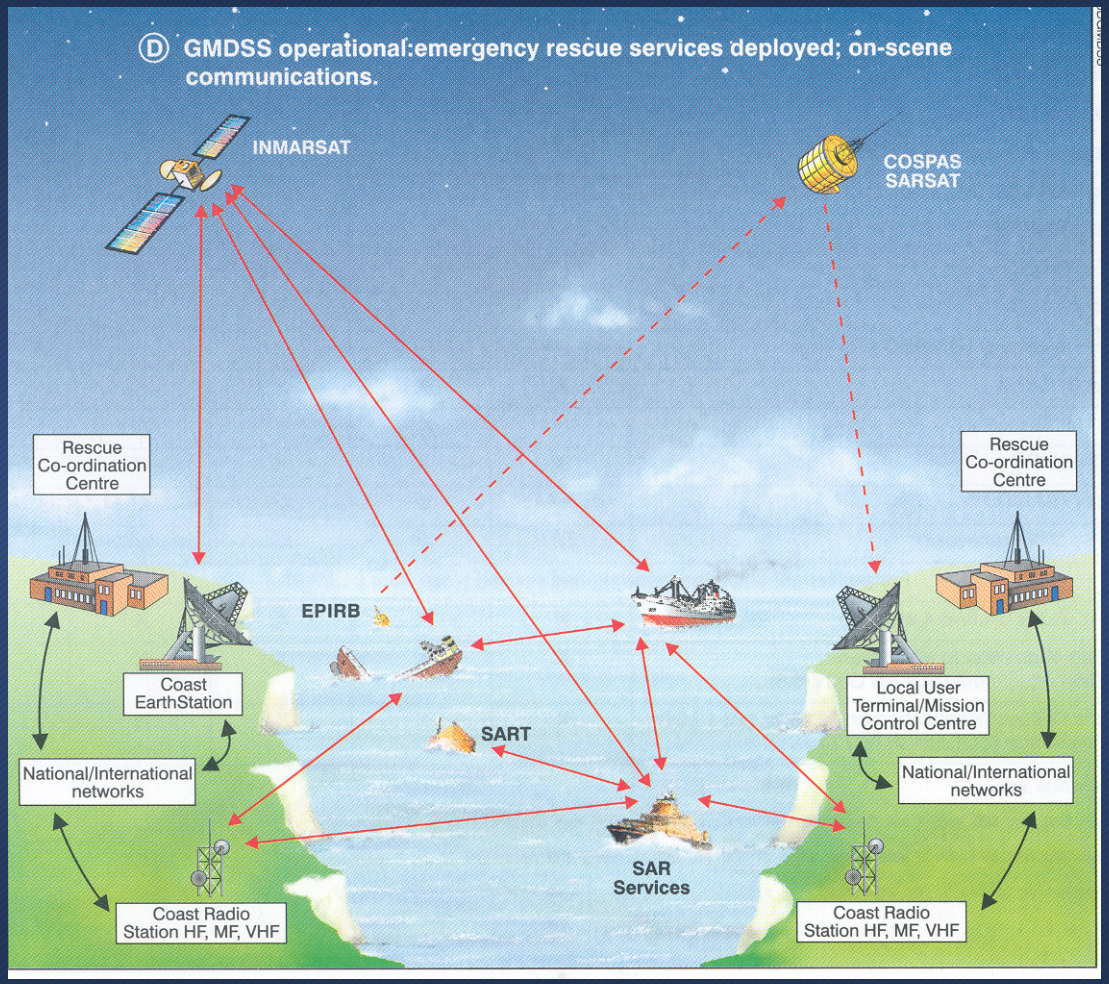
Typical distress scenario - 1



Typical distress scenario - 2



Typical distress scenario - 3



The South African Context!

Telkom SA Ltd is the service provider for Safety of Life at Sea (SOLAS) / GMDSS services to the SA Department of Transport

Introduction continued

- Cape Town, Milnerton - main controlling station and standby HF receiver site
- Thirty six MF and VHF remote sites along the coast
- Klipheuwel, 40 km inland for Milnerton - main High Frequency high power transmitting station.
- Yzerfontein on Cape west coast - remote main HF receiving site
- The controlling station is manned 24 hr, 7 days a week, 365 days a year.
- South Africa's Search and Rescue communications capability is a combination of GMDSS and "SOLAS type" services.

Introduction continued

- The Republic of South Africa is a party to the International Convention for the Safety of Life at Sea (SOLAS) and its enhancements (GMDSS etc))
- The Department of Transport is the responsible authority for implementing these conventions
- Telkom SA Ltd, Maritime Services, as the contracted service provider, provides the equipment, maintenance, services, facilities and radio communication and other infrastructure necessary for these purposes.

Coast Radio Station facilities in SA - GMDSS

- SafetyNET Inmarsat "C" MSI service via Goonhilly in the UK or Burum in the Netherlands – also used for transmission of urgency and distress messages
- COSPAS SARSAT satellite alerting system - LUT and MCC in CT
- DSC (Area A3) – from CT on 4, 6, 8,12 and 16 MHz
- Navtex for MSI from Cape Town, Port Elizabeth and Durban – also used for transmission of urgency and distress messages

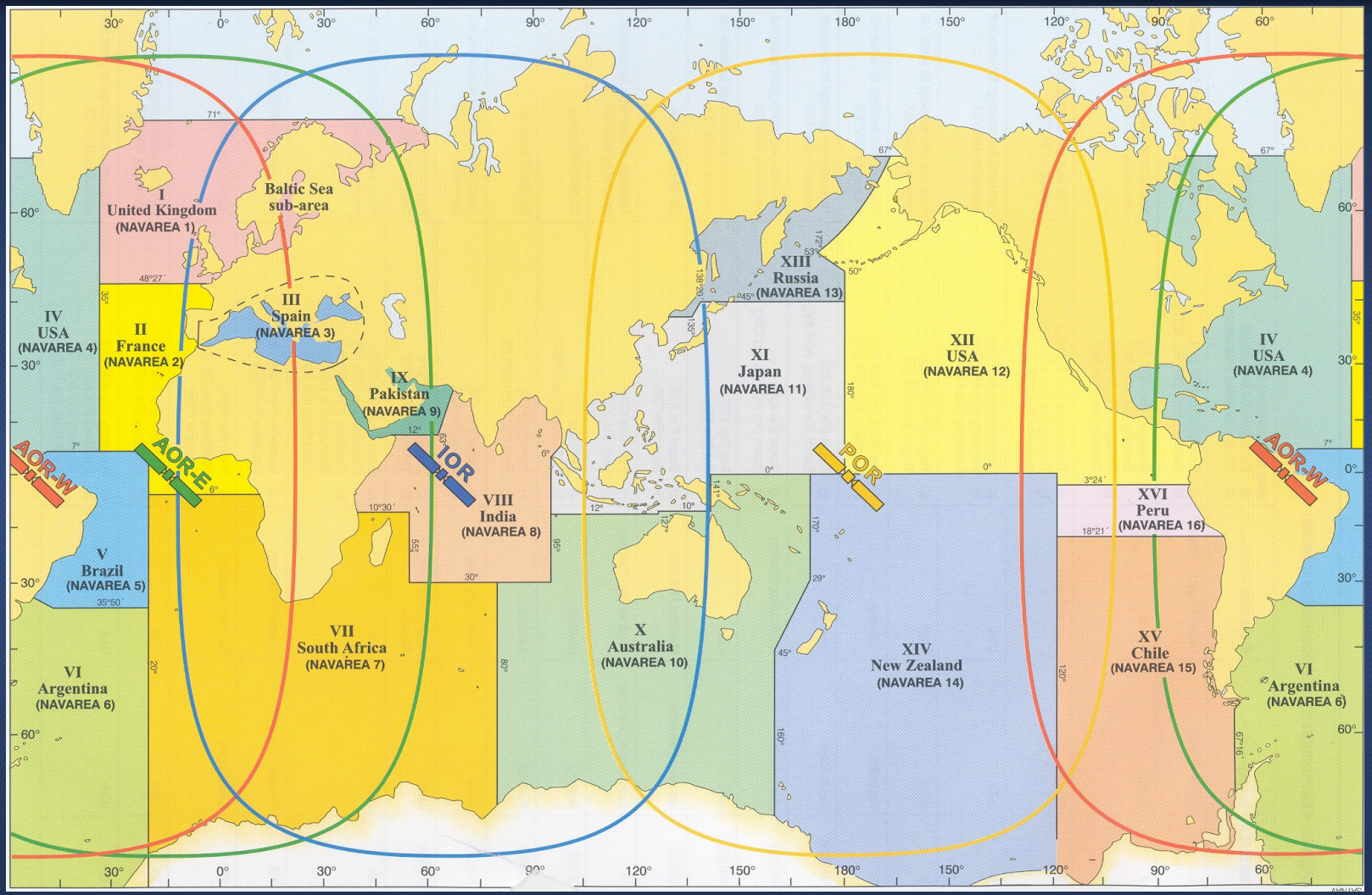
Coast Radio Station facilities in SA – "SOLAS"

- VHF Radiotelephony CH 16 watch keeping
- MF Radiotelephony 2182 KHz watch keeping
- HF watch keeping on Ch 421, 821, 1221, 1621 and 2221
- Transmission of MSI on VHF and HF radiotelephony
- SAFREP – voluntary vessel reporting system
- Receipt of Pre-arrival reports (PAR's)
- Will also accept AMVER's – passed to USCG

Remote sites along the coast

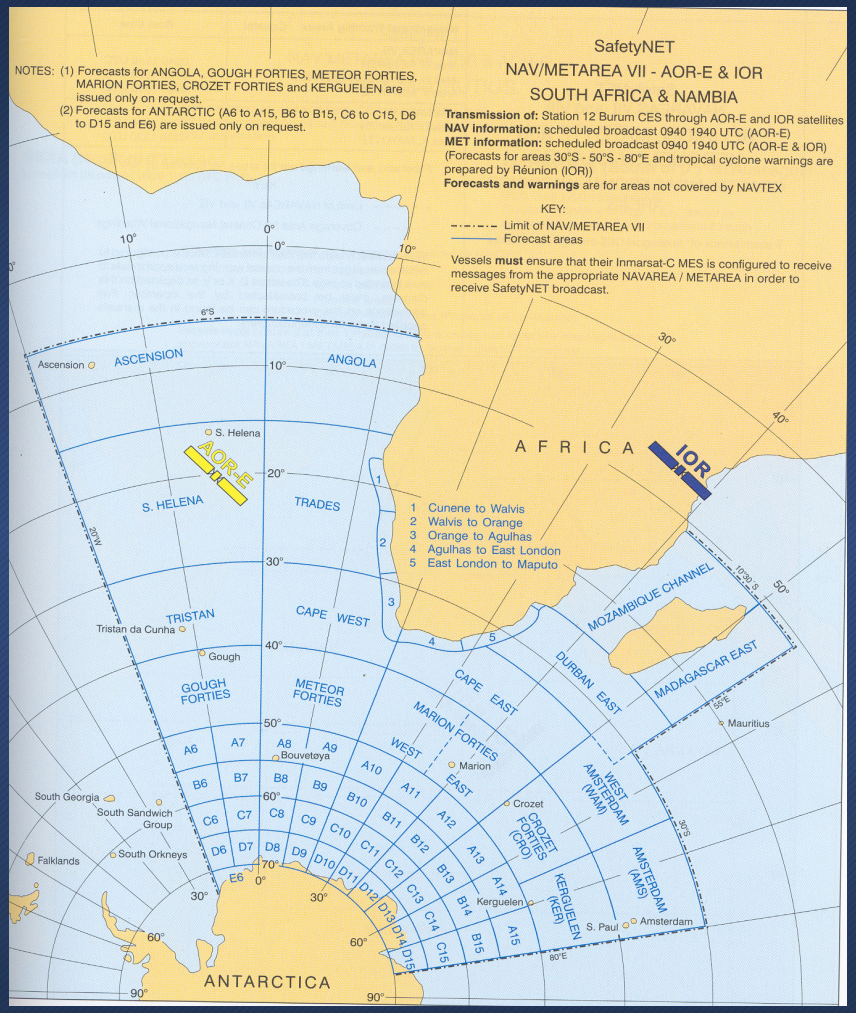
South Africa's search and rescue area

Nav / Met areas of the world



Nav / Met area 7

SA's responsibility. Transmitted using SafetyNET mechanism on Inmarsat C. Coastal areas on Navtex. Also on VHF and HF Radiotelephony on 4, 8 and 13 MHz



DSC area

South Africa has declared area A3 i.e. HF DSC on 4, 6, 8, 12 and 16 MHz Dual redundant system in Cape Town

Thank You