L'AGENCE NATIONALE DES FREQUENCES (ANFR)

From Titanic to satellite…… from Morse to digital
Entry in a new era for the maritime community

ITU regional seminar 6-8 June 2018
St-Petersburg, Russian Federation

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106 years ago (April 14th, 1912 at 0:15)

The TITANIC sent its SOS on 500 kHz in telegraphy mode

The TITANIC sank on April 15th, 1912 at 2:20

The Times Dispatch

RICHMOND, VA., TUESDAY, APRIL 16, 1912. PRICE TWO CENTS.

Titanic, Giant White Star Liner, Sinks After Collision With Iceberg on Her Maiden Voyage, and 1,800 Lives Are Reported Lost in World's Greatest Marine Disaster

WIRELESS CALLS SEND VESSELS RUSHING TO AID OF SEA COLOSSUS

Through the Night They Drive With Full Speed to Reach Titanic.

MEANTIME, WORLD WAITS IN AGONY OF SUSPENSE

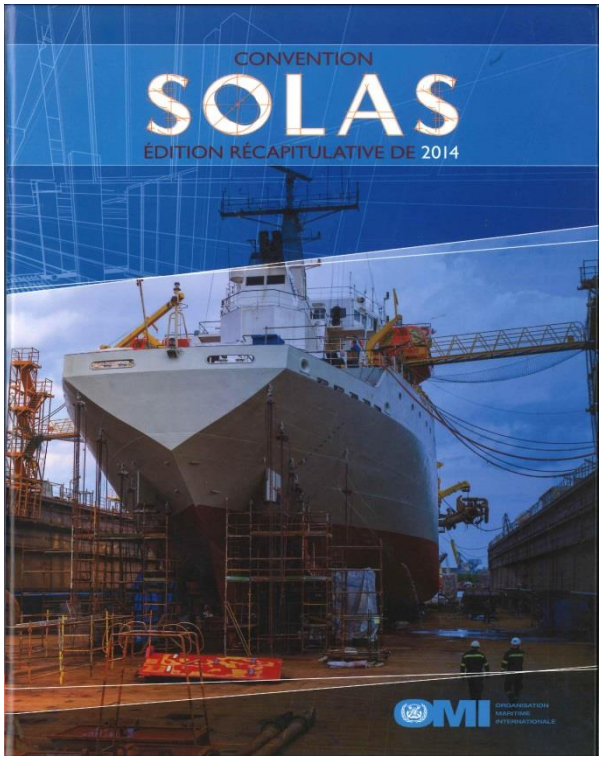
Steaming Liners Arrive Too Late, and Biggest and Most Luxurious Ship in World Goes Down, Carrying Hundreds of Passengers and Crew, Icebergs Making Mock of Science Which Had Given at Its Best to Make This Sea-Palace Indestructible and Unsinkable.

THE TITANIC

OF ALL ON BOARD ONLY 675 KNOWN TO HAVE ESCAPED DEATH IN OCEAN

Those Rescued Mostly Women and Children, Who Were Taken Off in Boats.

BITS OF WRECKAGE ALL THAT IS LEFT OF GREAT VESSEL



Two years later (1914) the first Convention SOLAS (Safety of life at sea) was established

- still in force
- wide range of measure to improve the shipping

From SOLAS
to the Global Maritime Distress and Safety System (GMDSS)

The Titanic disaster brought about a number of fundamental changes to marine radio:
Carriage requirements
Radio watch-keeping hours
Message priorities
Distress frequencies were standardized;
Radio silence periods were introduced.

The 1979 IMO Assembly decided that a new global distress and safety system should be established in conjunction with a coordinated SAR infrastructure to improve safety of life at sea. And so was born the GMDSS which has been fully implemented in 1999.

Areas of operation for the GMDSS

As the various sub-systems which make up the GMDSS have different limitations with respect to ocean coverage, the equipment required to be carried by a ship is determined by the ship's area of operation. In all areas of operation a ship is required to have the continuous availability of alerting.

Sea area A1

Within range of VHF coast stations with continuous DSC alerting available. (About 20–30 miles)

Sea area A2

Beyond sea area A1, but within range of MF coastal stations with continuous DSC alerting available. (About 100 miles)

Sea area A3

Beyond the first two sea areas but within coverage of Inmarsat satellites. (Roughly area between 70°N and 70°S)

Sea area A4

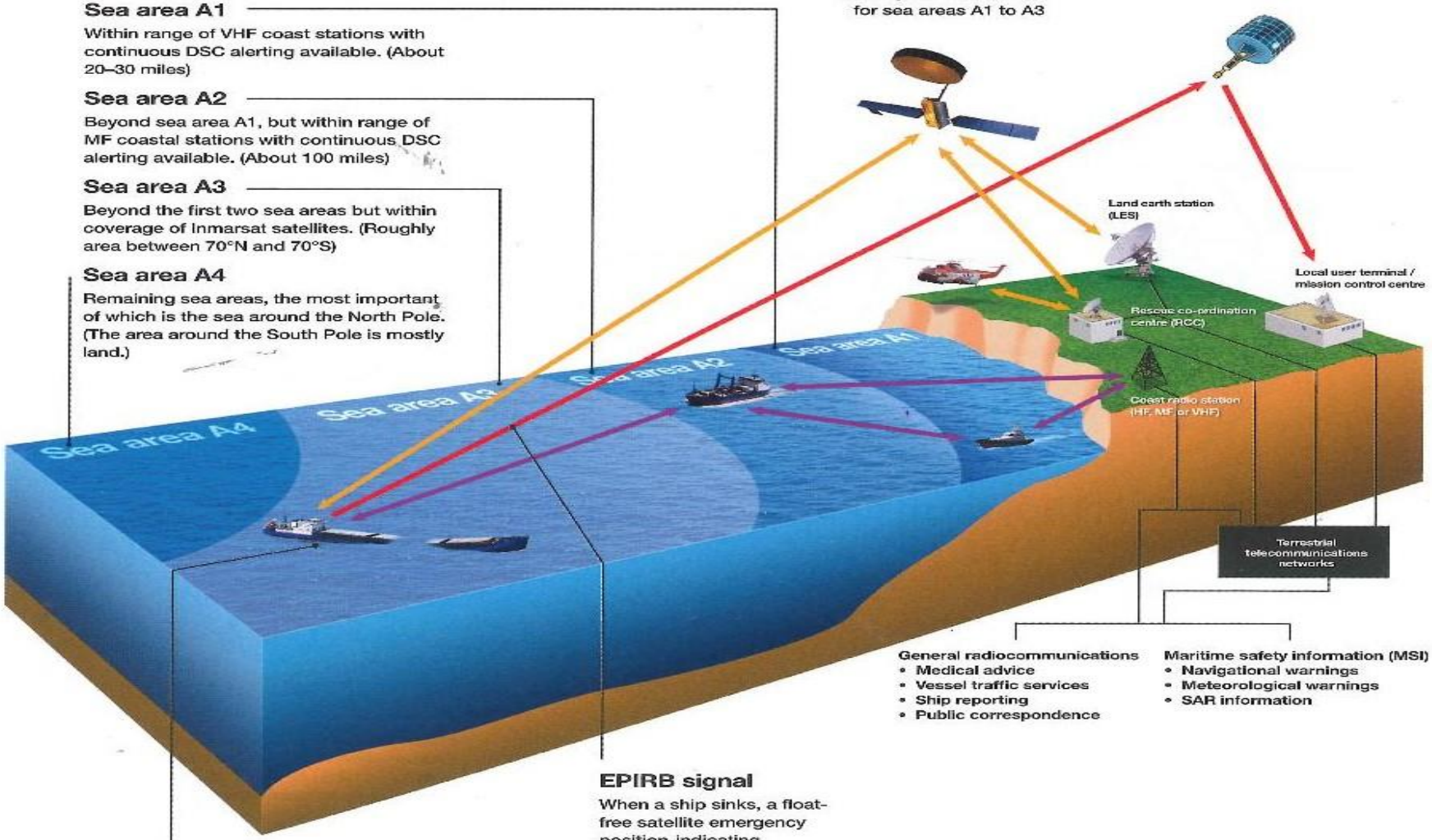
Remaining sea areas, the most important of which is the sea around the North Pole. (The area around the South Pole is mostly land.)

Inmarsat

A system of geostationary satellites providing two-way communication for sea areas A1 to A3

Cospas-Sarsat

A system of polar-orbiting and geostationary satellites operating globally, designed for 406 MHz EPIRB distress alerts. Does not provide two-way communication.



General radiocommunications
- Medical advice
- Vessel traffic services
- Ship reporting
- Public correspondence

Maritime safety information (MSI)
- Navigational warnings
- Meteorological warnings
- SAR information

EPIRB signal

When a ship sinks, a float-free satellite emergency position-indicating radio beacon (EPIRB) is automatically activated.

Ship in distress

A distress alert is normally initiated manually and all distress alerts are acknowledged manually.

The present 9 GMDSS functional requirements

GMDSS

Distress !

1. Transmitting ship-to-shore distress alert
2. Receiving shore-to-ship distress alert
3. Transmitting & receiving ship-to-ship distress alert

SAR Search and Rescue

4. Transmitting & receiving SAR coordinating communication
5. Transmitting & receiving on-scene communication
6. Transmitting & receiving signals for locating

MSI Maritime Safety Information

7. Transmitting & receiving maritime safety information

8. Transmitting & receiving general radio communication to and from shore-based radio system or network

9. Transmitting & receiving bridge to bridge communication

Why SOLAS/GMDSS is link with ITU Radio Regulation

- Spectrum for GMDSS need to be clearly identified and protected

  Done through RR Article 5 and various Appendix

- Administrative and operational part of the GMDSS are defined in the RR
  - Authority of the master, Operator certificate, Inspections of stations,
  - working hours of stations, conditions to be observed in the maritime services,
  - Order of priority of communications,
  - Operational procedures for distress, urgency and safety communications

World Radio Conference
Some decisions concerning maritime radiocommunications

- Making **a worldwide allocation** to the maritime mobile service in the **495–505 kHz** band - which would enhance transmission of safety and security information in ports and coastal waters;
- Adopting a new allocation to the mobile-satellite service around **156 MHz** for satellite detection of automatic identification system signals;
- Revising Appendix 18 of the Radio Regulations in order to implement new digital technologies in the band 156–174 MHz;
- Adopting the future frequency and channeling arrangements in the high-frequency bands for the maritime mobile service (Appendix 17 of the Radio Regulations);
- Modifying provisions of Article 47 - dealing with operator's certificates.

What will be the modernized GMDSS?

After 40 years since the inception and nearly 20 years after its full implementation, it’s to ensure that GMDSS responsive to the evolution of technology

Order of priorities in use for radiocommunications <u>still</u> needed

1. **Distress** alerts, calls, distress messages and distress traffic
2. **Urgency** communications
3. **Safety** communications
4. **Other** communications

What will be the modernized GMDSS?

- Effort to simplify the wording in order to help the seafarer (but also coastal authority) in a better understanding of GMDSS
- Introduction of all the modern technology which will arrived in the close future
- Establish the ground for the e-navigation concept:

The harmonized collection, integration, exchange, presentation and analysis of marine information onboard and ashore by electronic means to enhance berth to berth navigation and related services for safety and security at sea and protection of the marine environment.

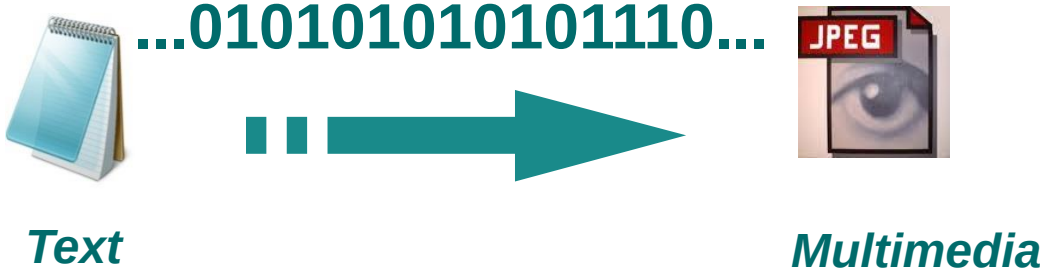
- Integration of additional mobile satellite systems: Iridium (Thuraya and Beidou)
- Review the definition of sea area

Which modern technology ?

NAVDAT: broadcasting maritime safety information

- Digital Modulation allows more important flow
- 15 to 25 kbit/s in a 10 kHz channel (more than 300 times the current NAVTEX analog transmission)
- Faster transmission time per message
- Transmissions files not limited to the texts but also:

  - Drawings
  - Graphs
  - Pictures
  - Data…

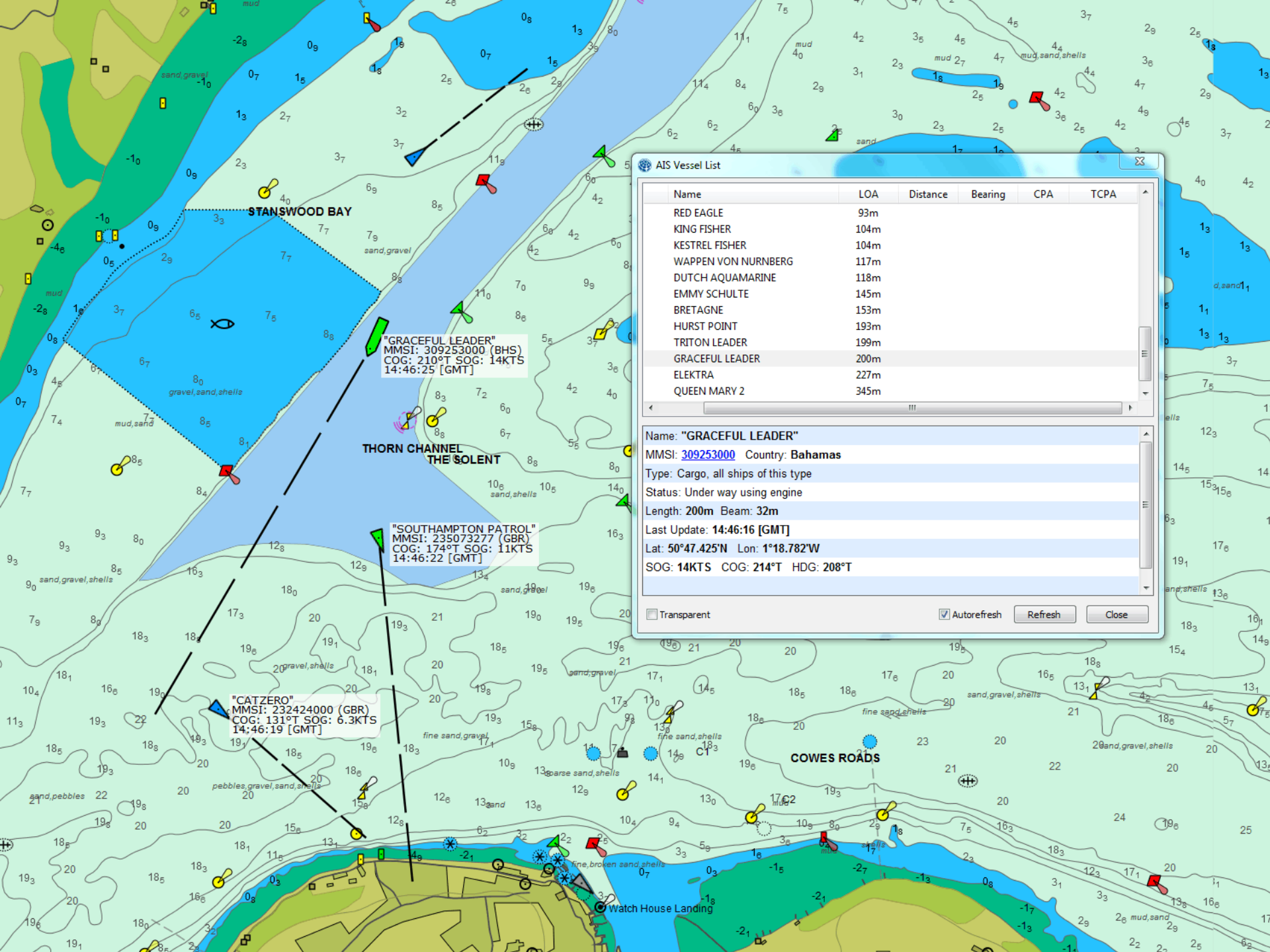


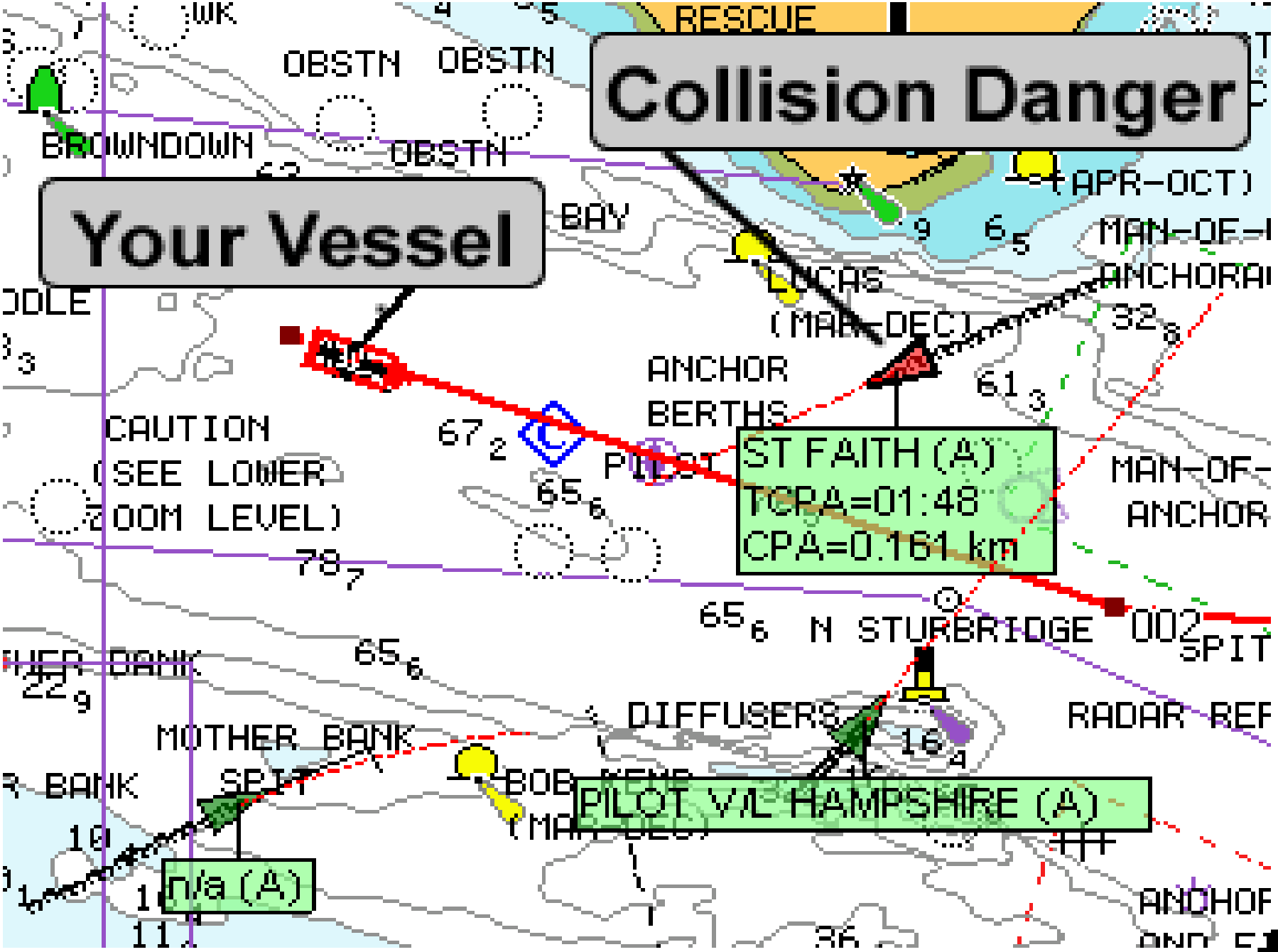
AIS – a victim of success / a success story for the maritime community

Automatic Identification system

Primary function of AIS is vessel location and identification

AIS allows automatic exchange of shipboard information from the vessel's sensors, including static and voyage related data between one vessel and another and between a vessel and a shore station(s)


STANSWOOD BAY
"GRACEFUL LEADER"
MMSI: 309253000 (BHS)
COG: 210°T SOG: 14KTS
14:46:25 [GMT]
THORN CHANNEL
THE SOLENT
"SOUTHAMPTON PATROL"
MMSI: 235073277 (GBR)
COG: 174°T SOG: 11KTS
14:46:22 [GMT]
"CATZERO"
MMSI: 232424000 (GBR)
COG: 131°T SOG: 6.3KTS
14:46:19 [GMT]
COWES ROADS
Watch House Landing
AIS Vessel List
Name
LOA
Distance
Bearing
CPA
TCPA
RED EAGLE 93m
KING FISHER 104m
KESTREL FISHER 104m
WAPPEN VON NURNBERG 117m
DUTCH AQUAMARINE 118m
EMMY SCHULTE 145m
BRETAGNE 153m
HURST POINT 193m
TRITON LEADER 199m
GRACEFUL LEADER 200m
ELEKTRA 227m
QUEEN MARY 2 345m
Name: "GRACEFUL LEADER"
MMSI: 309253000 Country: Bahamas
Type: Cargo, all ships of this type
Status: Under way using engine
Length: 200m Beam: 32m
Last Update: 14:46:16 [GMT]
Lat: 50°47.425'N Lon: 1°18.782'W
SOG: 14KTS COG: 214°T HDG: 208°T
Transparent
Autorefresh
Refresh
Close


Collision Danger
Your Vessel
RESCUE
OBSTN
OBSTN
OBSTN
BROWNDOWN
BAY
(APR-OCT)
LOCAS
(MAR-DEC)
ANCHOR
BERTHS
CAUTION
(SEE LOWER
ZOOM LEVEL)
ST FAITH (A)
TCPA=01:48
CPA=0.161 km
N STURBRIDGE
DIFFUSERS
MOTHER BANK
SPIT
BOB
PILOT V/L HAMPSHIRE (A)
n/a (A)
RADAR REF

AIS – a victim of success / a success story for the maritime community

Automatic Identification system

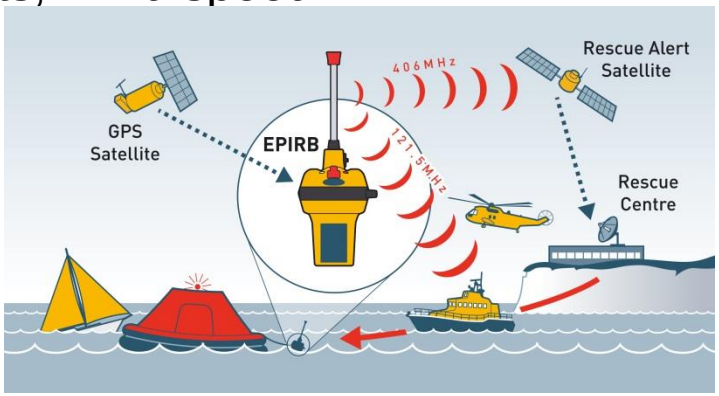
2 class of equipment Class A (SOLAS ship) and class B (others)
100,000 + AIS stations globally – and growing exponentially!
AIS is the tool box of seafarers

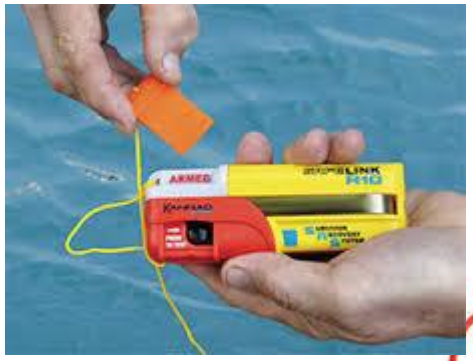
2 VHF frequencies designated in1997 AIS 1, AIS 2
In 2012 AIS 3, AIS 4 for detection of AIS by satellite
So successful that In 2015, 2 new frequencies have been designated AIS 5, AIS 6 call ASM 1, ASM 2 in order to avoid the congestion of the AIS system in some part of the world

Why ?

AIS is affordable
AIS can allow you to see as well as being seen.
AIS can also support binary messages
Many others applications have been developed using AIS technology

Other users – fishing, inland, recreational vessel, etc.
Other units - AtoN, SART, MOB, EPIRB
Messaging / transmitting ability – ASM, V-AtoN, Oceanic meteorological data transmitter, eg Tidal, Wave Heights, Wind speed
Satellite detection of AIS
Shore based AIS – VTS, ship reporting





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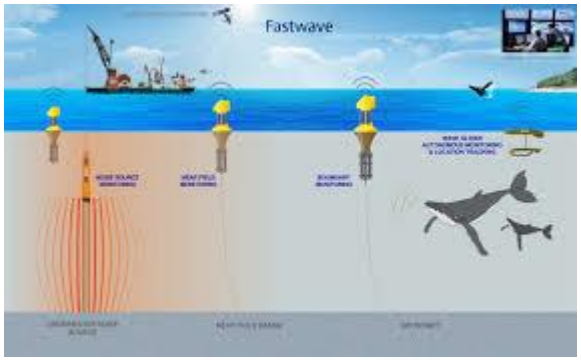
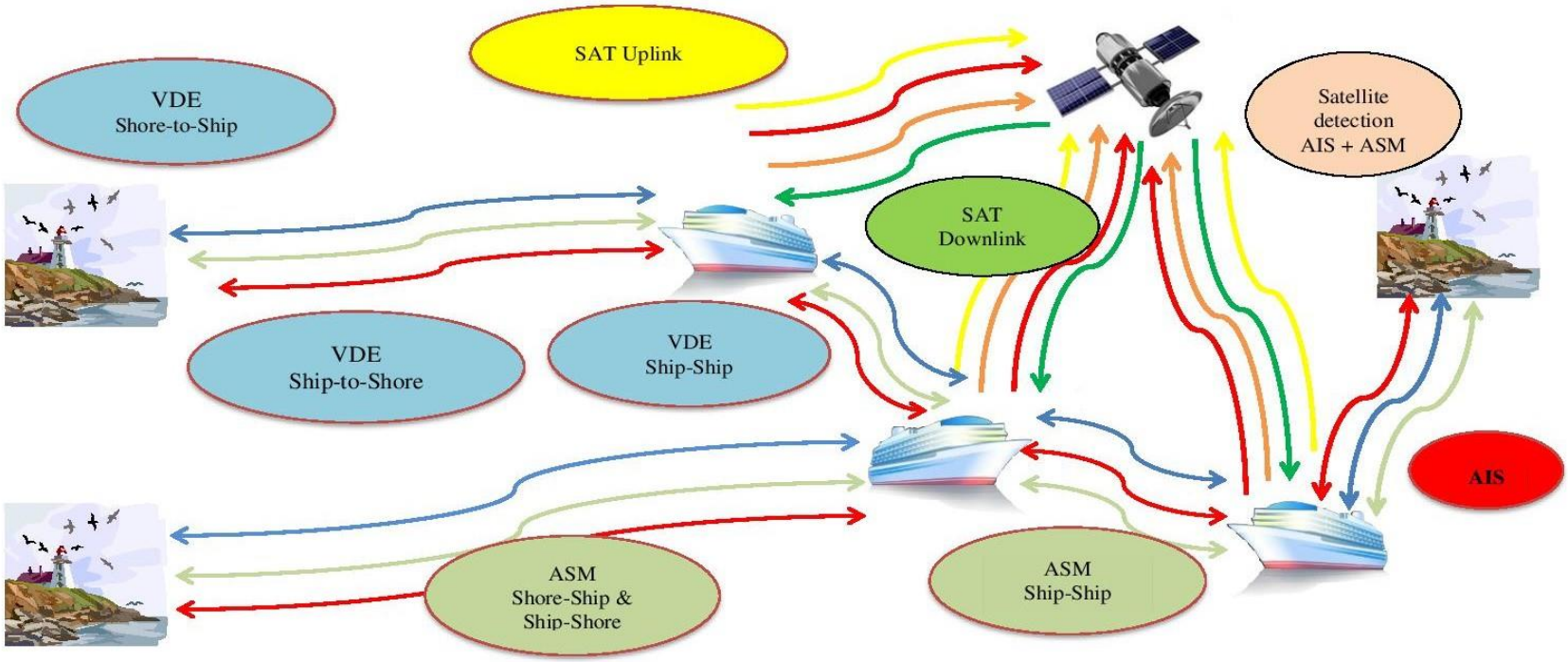


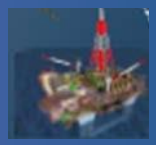
VDES
VHF Data exchange system

System working on VHF frequencies, comprising of a satellite component and a terrestrial component, which incudes :
Automatic Identification system (AIS), Application specific message (ASM)
VHF data exchange terrestrial and satellite component
The terrestrial component has been approved at WRC-15
Now WRC-19 is looking for the satellite component



Ship/Ship & Ship/Shore

Offshore / infrastructure



Port and approaches / inland waters

- VDES *
- 3G/4G (LTE)
- *(Wifi)*

Coastal waters / confined waters

- VDES *
- VHF (digital?)
- LTE-A/LTE-M?

- VDES *
- Satellite
- MF/HF (digital?)

Open Sea / Polar / other remote areas

- VDES*
- Satellite
- HF (digital?)

30-40 nm

40-100 nm

100 nm +

* VDES includes AIS, ASM, VDE-T, VDE-S

20 years of evolution of the maritime VHF band (Appendix 18)

1997… 2007… 2012… 2015… 2019 ???

AIS3	Distress	AIS4
75	16	76
AIS TER		AIS TER
SAT AIS		SAT AIS

VDE					
1024	1084	1025	1085	1026	1086
VDE-TER					
VDE-SAT Uplink				VDE-SAT Uplink	

	VDE						ASM1	AIS1	ASM2	AIS2
	2024	2084	2025	2085	2026	2086	2027	AIS1	2028	AIS2
	VDE-TER						ASM TER	AIS TER	ASM TER	AIS TER
VDE-SAT Downlink	VDE-SAT Uplink				VDE-SAT Uplink		ASM SAT	AIS SAT	ASM SAT	AIS SAT

We have reached the maximum capacity for the Appendix 18 in its current form

152-174 MHz

RR Appendix 18

We need spectrum for maritime

Over 80% of world trade is transported by sea.
10 billion tonnes of which about 29% is oil, 30% is bulk (ore, coal, grain and phosphates), the remaining 41% being general cargo.
Operating these merchant ships generates an estimated annual income of $380 billion in freight rates within the global economy, amounting to 5% of total world trade.
The industry employs over 1.5 million seafarers.

All the new applications which will arrived in the close future will need spectrum

Trends and wishes for the future

- E-navigation would encompass NAVDAT, VDES
  Global warming created new routes which will have new needs for communications
- Maritime autonomous surface ships (MASS)
- Satellite will continue to be a major element

- Revival of HF ???
- For VHF go completely to digital and switch to a 12.5 kHz channel spacing ???

Thanks a lot!

Any question?

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