United States Coast Guard
Spectrum Management
CG-672

Presentation to Developing World Regulators and Spectrum Managers
Overview

- Coordination and Spectrum Management
- Coast Guard Mission
- WHERE?
- WHY? and HOW?
  - Safety of Life at Sea (SOLAS)
  - Global Maritime Distress and Safety System (GMDSS)
- Summary
Coordination and Spectrum Management
REMEMBER

RF does not stop at the border(s)!!!
National Spectrum Management - How it’s managed in the USA

- NTIA (National Telecommunications Information Administration)
  Regulates spectrum for Federal agencies

- FCC (Federal Communication Commission)
  Regulates spectrum for Non-Federal, Commercial, Public and Private entities

FCC-regulated frequencies are available to federal agencies on a case-by-case basis when coordinated and agreed to by the FCC (examples: State and Local non-federal authorities)
National Coordination

• Coast Guard works with the Federal Communications Commission (FCC) to establish Civil Maritime Rules
• Formally under 47 CFR Part 80
• Defines radio stations on land and onboard ship.
• This radio service allocation provides for safety of life and property at sea and on inland waterways.
International Coordination
International Coordination

• **NTIA** – RCS (Radio Conference Subcommittee)
  – Develops **US Federal** positions for World Radio Conference (WRC)
  – Leads International Telecommunications Union (ITU) Working Party Delegations

• **FCC** – WAC (World Radio Conf Advisory Committee)
  – Develops **US non-Federal** positions for WRC

• **DOD** – IPWG (International Permanent Working Group)
  – Develops DOD/Military Service and NATO positions

• **State Department** - Special Committee
  – Reconciles and establishes US final positions
  – State also head of (Conference Preparatory Meetings (CPM) and WRC delegations
International Coordination continued...

- As part of the U.S. Delegation to the UN World Radio Conference (WRC), the Coast Guard helps shape International Telecommunications Policy.

- Accomplished through the UN International Telecommunications Union (ITU) (Geneva, Switzerland)

- Also participates in the UN International Maritime Organization (IMO) (London, UK) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) (Paris, France)
International Telecommunications Union

• World Radio Conference (WRC) – US Maritime Reps
  ▪ Next WRC is in 2019. CG-672 will be sending 1 Rep & 3 contractors

• Conference Preparatory Meeting (CPM) – US Maritime Reps

• Study Group 5:
  ▪ Working Party 5A - Land mobile service excluding IMT; amateur and amateur-satellite service
  ▪ Working Party 5B - Maritime mobile service including the Global Maritime Distress and Safety System (GMDSS); the aeronautical mobile service and the radiodetermination service
  ▪ Working Party 5C - Fixed wireless systems; HF systems in the fixed and land mobile services

• Inter-American Telecommunication Commission (CITEL)
  ▪ Establish a Region 2 (North and South America and Caribbean) position for WRC Agenda Items
International Maritime Organization –

• Navigation, Communication, Search & Rescue (NCSR)
  ▪ Of Technical Working Group - CG-672 participates in the developing Recommendations and Standards in coordination with ITU WP5B as well as GMDSS policy and procedures, Polar communications, and search and rescue (SAR) communications. Support CG-NAV and CG-SAR. Sponsored Iridium application to become a GMDSS service provider.

• IMO/ITU Joint Experts Group
  ▪ Establish IMO WRC positions
  ▪ Global Maritime Distress and Safety System (GMDSS) Modernization
  ▪ Navigation Communication Search and Rescue (NCSR) support
WRC-19 US Maritime Agenda

• VHF Data Exchange System (VDES) Preparations to defend VHF Satellite uplink.
• Iridium – Prepare consequential changes to the Radio Regulations as a result of additional GMDSS satellite providers.
• GMDSS Modernization - Prepare consequential changes to the Radio Regulations as a result of this effort.
• Define Autonomous Maritime Devices
Coast Guard Mission

➢ The Coast Guard’s primary purpose is to safeguard our nation’s maritime interests and environment around the world.

➢ By law, the Coast Guard has 11 missions:
  - 5 Homeland Security Missions
  - 6 Non-homeland Security Missions
MISSIONS

- Homeland Security Missions
  (A) Ports, waterways and coastal security.
  (B) Drug interdiction.
  (C) Migrant interdiction.
  (D) Defense readiness.
  (E) Other law enforcement.
Missions Continued...

Non-Homeland Security Missions

(A) Marine safety.
(B) Search and rescue.
(C) Aids to navigation.
(D) Living marine resources (fisheries law enforcement).
(E) Marine environmental protection.
(F) Ice operations.
Migrant interdiction
$500 million in cocaine seized in 1 stop
We find “subs” carrying drugs too
Marine Safety
an “ambulance and police service” for mariners
Deepwater-Horizon oil spill management
USCG “clearing a path”
USCG response to Hurricane Dorian
Latest...10 September 2019, 24 rescued from cargo ship “Golden Ray” capsized off the Georgia coast
Cutting though the hull of cargo ship “Golden Ray” to rescue the remaining 4 trapped crew
Average Coast Guard Day

- Conducts 45 search and rescue cases;
- Saves 10 lives;
- Seizes 874 pounds of cocaine and 214 pounds of marijuana;
- Conducts 57 waterborne patrols of critical maritime infrastructure;
- Interdicts 17 illegal migrants;
- Conducts 24 security boardings in and around U.S. ports;
- Screens 360 merchant vessels for potential security threats prior to arrival in U.S. ports;
- Completes 26 safety examinations on foreign vessels;
- Conducts 105 marine inspections;
- Investigates 14 marine casualties involving commercial vessels;
- Facilitates movement of $8.7B worth of goods and commodities through the Nation’s Maritime Transportation System.
Where?
Where does Coast Guard operate?

All over the globe
International waters
Coast Guard Spectrum Requirements

- Coast Guard operates multiple assets that require national level spectrum certification
  - Coast Guard Cutters
  - Global Maritime Distress & Safety System (GMDSS)
  - Fixed Wing and Rotary Aircraft
  - Land Stations
USCG Operations by Band

- **VHF LMR Band 1710**
- **High Frequency 7750**

**VHF Marine Band 5370**

- **LORAN, DGPS, NAVTEX 100-518KHz**
- **Security/Utility/LMR/AIS 162-174MHz**
- **VHF Marine, CG AUX/AIS 156-162MHz**
- **CG AUX Operations/Misc 130-150MHz**
- **Video Links 21-24GHz**
- **Microwave/TACAN 900-945MHz**
- **Microwave/TACAN 1000-2400MHz**
- **Radars/RACONS 2400-4000MHz**
- **SAR/Working/MF/HF 2-30MHz**
- **Microwave 7/8GHz**
- **VHF Aeronautical 100-130MHz**
- **Mutual Aid (S160) 30-100 MHz, 150-157MHz**
- **UHF Aeronautical/SAR/Working 200-400MHz**
- **Radars/RACONS 9000-11000MHz**
- **LE Working/Link/Utility 406-420MHz**
Where does the USCG use these frequencies?

• On all of our Assets including aircraft and marine vessels
• Connection with Federal, State, and Local
• Satellite, Radar, P-P microwave, 2-way, etc.,
• International waters
Types of USCG Maritime Assets

- USCG Cutter
- Short range interceptor
- Surface Search Radar
- SAR Sea Search Radar
- Close-in-Weapons System (CIWS)
- Various VHF, UHF & EHF Radiocommunication Systems
Types of USCG Airborne Assets

- Search & Weather Radar
- Air Search Radar
- NAVSTAR GPS
- Radiocommunications suite
WHY? and HOW?

SAFETY, SAFETY, SAFETY
Safety of Life at Sea* (SOLAS)

Chapter IV – Radiocommunications

- Digital Selective Calling (DSC)
- Emergency Position Indicating Radio Beacon (EPIRB)
- Global Maritime Distress Safety System (GMDSS)

Chapter V - Safety of navigation

- Navigation safety services (Radio Beacons)
- Automatic Identification Systems (AIS)

* International Maritime Treaty through the International Maritime Organization (IMO)
Digital Selective Calling (DSC)

- DSC used to initiate communications (911 of the seas)
- Priorities: Distress, Urgency, Safety, Routine
- Types of Call: All Ships, Group, Geographic Area, Individual
- Distress Calls are “All Ships” calls:

One Button Activation

Position
Time
Ship’s Identity (MMSI #)
Nature of Distress

10/11/2019
Maritime Mobile Service Identities (MMSI) numbers uniquely identify your vessel and must be obtained for each vessel through BOATS US, FCC, IRAC, etc, depending on whether the vessel is private, commercial, or Federal.

The DSC radio must also be installed with a GPS receiver.

Digital Selective Calling (DSC) Distress button

Channel 16 (156.8 MHz) auto preset
EPIRB’S

Emergency Position Indicating Radio Beacons work on small boats and are required on large ships

Utilize VHF frequencies (406 MHz and 121.5 MHz)
Rescue 21

1. Distress signal is sent out to multiple receivers from sinking boat via their DSC-enabled VHF radio.

2. The emergency signal is instantly received, displayed, and repeated by all DSC radios within range - allowing nearby vessels to become first responders.

3. Signal is also immediately picked up by Rescue 21 towers on land, which determine bearing to the distressed vessel.

4. Information about the boat in distress, and its exact position, is rapidly relayed to the Coast Guard, which makes contact with the crew of the boat and launches rescue operations.
RACON
Triggered by S-Band or X-Band Radar

RADIO BEACONS
Reason why some bridges need RACONs
Example: Ship radar display for RACONs at San Francisco to Oakland Bay Bridge
Automatic Identification System ("AIS") on VHF marine channels
What is GMDSS?

- A global maritime distress and safety system
- Uses satellite, advanced terrestrial technology, and shipboard radio systems
- Facilitates rapid, automated distress alerting to shore-based rescue authorities
- Facilitates timely, automated safety communications to mariners
FUNCTIONAL REQUIREMENTS OF GMDSS AND INTERNATIONAL REQUIREMENTS

GMDSS compliant ships at sea must be able to:

Transmit ship-to-shore distress alerts by at least two separate and independent means, each using a different radio-communication service

Receive shore-to-ship distress alerts

Transmit and receive ship-to-ship distress alerts

Transmit and receive search and rescue coordinating communications
REQUIREMENTS cont’d

Transmit and receive on-scene communications
Transmit and receive signals for locating
Transmit and receive maritime safety information
Transmit and receive general radio communications from shore-based radio systems or networks
Transmit and receive bridge-to-bridge communications
Why GMDSS?

- Enhance **Worldwide** Ship-to-Shore Communications for distress alerts
- Serve as “umbrella” for existing/future communications technologies
- Links equipment carriage requirements to where ships operate (Sea Areas)
GMDSS Applies To:

- SOLAS Class Vessels —
  - Commercial, 300 GRT or greater
  - Passenger ships

Does Not Apply To:

- Recreational boats
- Fishing vessels
- Vessels that operate exclusively on the Great Lakes.
Components of GMDSS

- System of Systems
  - DSC – Primary Component of GMDSS
    - MF, HF & VHF-FM & Voice Comms
  - NAVTEX (NAVDAT HF future)
    - Coastal coverage (MF) up to 450 miles offshore
  - Inmarsat – Iridium
  - Survival craft VHF radios
System of Systems continued….

- **SITOR / NBDP** (simplex teletype over radio/narrow band direct printing) Weather updates

- **SafetyNet/EGC** (Enhanced Group Call)
  - Inmarsat C

- **Additional assets**
  - Satellite 406 MHz EPIRB
  - Maritime Safety information (MSI) and Urgent Marine Information Broadcast (UMIB) Voice Broadcasts
  - **SART** (Search and Rescue Transponder)
Principles of Communications
International Maritime Satellite (Inmarsat)
Recent addition to GMDSS
Iridium “Pole to Pole” constellations
PAST/PRESENT
Operations though the North West passage.

The FUTURE???(is here)
GMDSS Sea Areas

Sea Area A1

0-20 Nautical Miles

Within range of VHF coastal stations w/ DSC / Voice
GMDSS Sea Areas

0-100 Nautical Miles

Within range of MF DSC/Voice coastal stations

Sea Area A2
GMDSS Sea Areas

Latitude 70N to 70S
Within Coverage of Geostationary Maritime Satellites (INMARSAT)
HF DSC

Sea Area - A3
GMDSS Sea Areas

Polar Regions:
70N to 90N & 70S to 90S

MF, HF, Polar orbiting satellites (Iridium)

Outside Sea Areas A1, A2, A3

Area A4 Established
Feb 1, 1999
Sea Area - A4

GMDSS Sea Areas

Polar Regions:
70N to 90N & 70S to 90S

MF, HF, Polar orbiting satellites (Iridium)

Outside Sea Areas A1, A2, A3

Area A4 Established Feb 1, 1999
USCG SUMMARY

- Spectrum Management must be handled both Nationally and Internationally
- USCG Operates around the globe under a number of missions
- Has a host of spectrum dependent systems used for National Security, Search & Rescue, and Maritime Safety
- SOLAS and GMDSS are crucial to maritime safety
- SEMPER PARATUS – Always Ready!
Coast Guard Spectrum Personnel

• Derrick J. Croinex (Chief, Comms Policy) (202) 475-3551
• Jerry Ulcek (Intrn’l/Nat’l Spectrum) (202) 475-3607
• Rick Joyce (Attorney) (202) 475-3556
• Ron Blackmore (FSD) (202) 475-3552
• Russell Levin (GMDSS Stds, Policy) (202) 475-3555
Questions?