

Search and Rescue Communications



Safety at Sea Seminar

Annapolis, MD
1 April 2012

Captain Kip Louttit
U.S. Coast Guard
Retired & Auxiliary



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The Objective: lots of this...



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...Not this:



Person on
hoist cable



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The problem... You are *here*...



4 people in water



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...and you want to be *here*:



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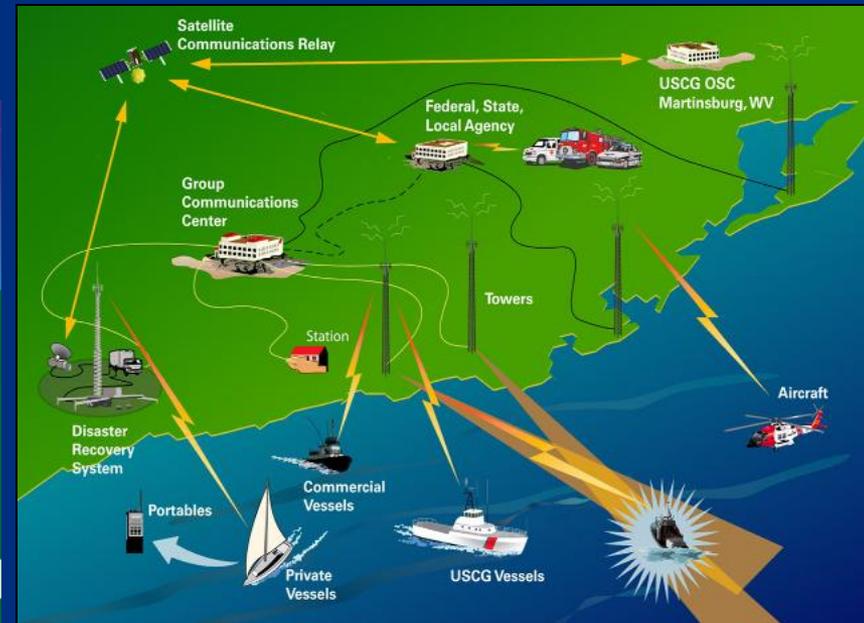
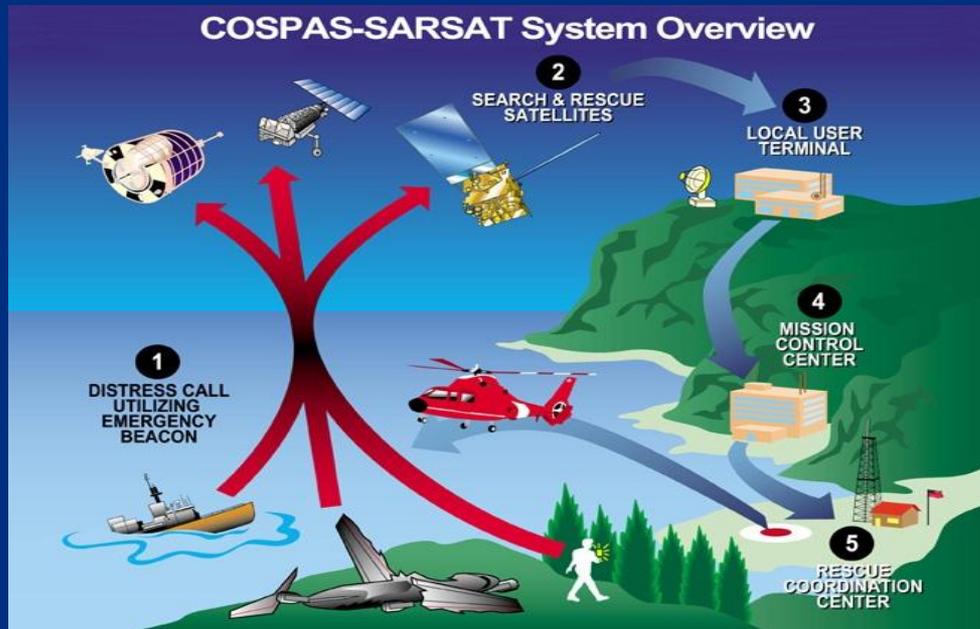
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SAR Comms will help you get there

Overall Concept...

whatever works best, the CG will use...



VHF-FM (Rescue 21)

406 EPIRBs



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Agenda

- Overview
- Distress Signals
- Global Maritime Distress & Safety System (GMDSS)
- VHF-FM & MF/HF SSB
 - Rescue-21
 - DSC & MMSIs
- EPIRBS & SARSAT
- Closing thoughts



Air Mail Annapolis/Hampton Race 2010



Me



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National SAR Manual

- Communications are a critical but often weak link in the SAR system.
- Personnel in distress have a variety of methods, ranging from sophisticated electronic devices to waving a piece of cloth, for alerting the SAR system.
- Priority goal: Provide communications which are highly reliable, **simple**, problem-free, interoperable, and as functionally effective as possible.



Recognized Distress Signals

- Slowly raising and lowering outstretched arms
- Continuous sounding of fog horn
- Red flares (night) and Orange smoke flares (day)
- Morse code SOS . . . - - - . . . by any signaling method (horn/flashlight). SOS outlined in logs/seaweed on the beach, written/taped on cabin top
- Three of anything... 3 fires, 3 whistles, 3 piles of brush
- Square Flag and Ball (often sold on an orange background in form of a flag)
- Radiotelephone Voice Mayday or Pan call
- Radiotelephone Digital Selective Calling (DSC) and other automatic alerts
- **EPIRBs, PLBs, ELTs**
- White Strobe Light (Inland Waters only) ...*don't use strobes as an anchor lights*
 - *But...* You will see white strobes marking fishing gear in International Waters



Guess what the light source is!



- 3 Jan 2012
- 12 ft seas & 35 kts of wind South of Jamaica
- CG Lookouts sighted the light at 2 miles
- Photo thru CGC Venturous Infra Red Camera
- Rescued 5 fishermen who had been in the water 10 hrs

A cell phone!



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Global Maritime Distress and Safety System (GMDSS)

- Components:
 - VHF-FM
 - HF
 - INMARSAT
 - EPIRBs
- Four “Sea Areas”
 - A1: **VHF-FM**, 20 miles from shore
 - A2: **HF**, 20-100 miles from shore
 - A3: INMARSAT, 70N to 70S
 - A4: Polar Regions



Air Mail start of 2004
Annapolis/Bermuda Race

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SAR & GMDSS Communications Zones

1. Bays, Rivers, Sounds, & Coastal to 20 miles
VHF-FM & Cell Phones

2. 20-100 miles offshore

3. Beyond 100 miles

EPIRBS,
MF/HF &
SAT Phones

Bottom Line:

Once you get more than 20 miles from shore,
you need more than VHF-FM & Cell Phones.



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Voice Communications

■ Satellite and Cell Phones

- Good and clear
- Can get weather/e-mail/web etc via laptop or smart phone
- But...
 - No one else can hear you, and
 - Coast Guard can't DF on the signal
 - Handoff between 911 & CG can be poor.

■ VHF-FM & MF/HF

- Party-line nature yields Good Samaritan help
- All CG and many others can DF on the signal



For all of you who are going to call the
Coast Guard by with satellite or cell
phones, here is the ##...

757-398-6700

USCG Atlantic Area
Command Center,
Portsmouth, VA



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New CG VHF-FM system... RESCUE-21

Features:

- Direction Finding (DF)
- More towers reduces coverage gaps
- Record and playback capability
- Digital Selective Calling
- Portable towers for emergencies
- Designed Range: Receive 1 watt transmission fm 2 meter height at 20 miles
 - (You in your cockpit w/ a handheld)



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Pros/Cons of VHF-FM

- Pros:
 - Very clear
 - Lots of users and channels
 - Hand-helds very capable
- Cons
 - Line-of-sight, so range based on antenna height:
 - 300' 20 mi
 - 115' 12 mi
 - 50' 8 mi
 - 7' 3 miles



What is digital selective calling? (DSC)



- Digital transfer of information between radios
- Instantly sends an automatically formatted distress alert to the Coast Guard & other vessels



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What does DSC do?

- Provides a one-touch button for distress
- ...and the CG will call you back on Channel 16
- ...prevents missed distress calls
- Your vessel is identified by unique Maritime Mobile Service Identity (MMSI) number
- Privately hails other DSC equipped vessels or shore stations
- Decreases non-emergency radio traffic on emergency channels
- Notifies boater of a call and automatically switches to the channel caller is waiting on by audible alert of message on screen
- Transmits GPS location of caller (if equipped)



What is a MMSI number?

- Maritime Mobile Service Identity number (MMSI)
 - Uniquely encoded 9 digit number with vessel & owner's information (like a phone number)
 - Identifies and helps find boater in a distress situation
 - Coast Guard maintains database for distress information retrieval
 - Store other vessels MMSI's into your radio (like a 'contact list')
 - You have to know a boater's MMSI to call them using DSC



Getting a MMSI

- It is FREE & only takes a few minutes
- Places to get MMSI numbers:
 1. BoatUS, SeaTow, U.S. Power Squadron
 - For Domestic U.S. use only
 2. **Federal Communications Commission** ← Key Point
 - **For International and Commercial use**
- **Once you obtain your MMSI, enter it into your DSC radio**
 - May need manufacturer if you make too many errors
 - Don't forget to change the info if you sell the boat or radio
- Info:
 - **Federal Communications Commission:**
wireless.fcc.gov/services/index
 - U.S. Coast Guard: www.navcen.uscg.gov/marcomms/Gmdss



What we see...



Distress from 366000003

Call Id:	2000374
Time:	040121 16:14:41
Carrier:	ch70
Workstation:	TR-OP3
Operator:	group3
Station:	Manasquan 100% 0
	Tuckerton 100% 0
Format:	Distress
From:	366000003 ← MMSI ##
	United States
Position:	39°41'N 073°56'W ← Position
Nature:	Man overboard ← Nature of Distress
TSC:	F3E/G3E simplex
End Of Sequence:	EOS
Raw DSC Symbols:	112 112 36 60 00 00 30 110 13 94 10 73 56 88 88 100 127 43

Acknowledge
Distress Relay
Uncheck
 Display Raw



➤ **Pros:**

MF/HF-SSB

Long range:

2182: 200 miles daytime; 500 miles at night; hops/skips

“Free” ... no per/minute charge as with Satellite Phones

Party-line nature...lots of info just by listening (eg: 4125 KHz)

Get weather-fax, e-mail, etc.

➤ **Cons:**

Need right installation (antenna/tuner/grounding) & license

May not be clear...often lots of static

Need to know what you are doing for frequency selection;

Lower at night & Higher in daytime

“Duplex” channels are complex to but powerful/useful;

Transmit on one freq and receive on another



➤ CG CAMSLANT = Chesapeake + Boston + Miami + New Orleans



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Radio Rules & Etiquette

- After establishing communications on Channel 16 or 2182, shift to an appropriate working frequency.
 - Do not converse on the Hailing/Distress/Safety Frequencies.
- Channel 9 is the alternate for hailing for recreational vessels.
- Wait 2 minutes between hails to give time for response.
 - You can't hear when you are transmitting.
 - Make sure you release the transmit button.
- Don't do radio checks on channel 16 or 2182.
- For channel 13 bridge-to-bridge, no need to call on 16 first.
- If you hear 1 side of a conversation, don't "step-on" the other side.
- No CB radio or "10 code" lingo



VHF-FM & HF Distress & Working Freqs

- **16 = 2182 - International Distress, Safety, and Calling**
- **22 = 2670 - CG to Maritime Public working frequency**
 - eg... Your distress traffic after establishing comms on 16/2182
 - eg... CG Urgent Marine Information Broadcasts, after 1st being announced on 16/2182
- **9 - Supplementary Calling/Hailing Freq for Recreational Vessels**
- **13 - Bridge to Bridge (ship bridges and real bridges!)**
- **6 - Inter-ship safety...good working frequency between vessels**
- **68 - Good working frequency for chit-chat between yourselves**
- **Vessel Traffic Services use a variety of freqs...12 common**



The Distress Call... *(Put Life Jackets On)*

- Make sure radio is on (not the loud hailer)
- Select Channel 16 VHF-FM or 2182 KHz HF
- Press and Hold the transmit button
- Clearly say MAYDAY MAYDAY MAYDAY, or PAN PAN PAN
- This is the Sailing Vessel *Kip*
- 1. **MY POSITION IS** _____
- 2. Number of people on board
- 3. Nature of Distress
- 4. Description of Vessel (name, length, type, make, color)
- “Over” ...Release the transmit button, ensure volume is up & listen



Position Tips

When giving your position, 1 decimal place is usually plenty:

- .1 minute = 200 yards
- .01 minute = 20 yards
- .001 minute = 2 yards

eg:

“U.S. Coast Guard, my position is:

32 degrees, 56.5 minutes North,

75 degrees, 37.3 minutes West,

Over.”

Adding a geographic reference can be useful...

“.....2 miles South of Wolf Trap Light.”

“...75 miles Southeast of Montauk Point.”



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When giving your position with respect to another vessel, give your position relative to him...that is, tell him what direction to look.

“Northbound black APL container ship South of Thomas Point Light this is the Southbound sailing vessel Kip 2 miles off your port bow, over.

...may add at night... “...with white flashlight on our sails.”



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EPIRBs, ELTs & PLBs

➤ Total rescues in 2011 in USA: 207 people

At Sea: 122 people in 40 incidents

Aviation: 14 people in 6 incidents

PLBs: 71 people in 42 incidents

Total: >30,000 people saved worldwide since 1982

➤ 406 EPIRBs and PLBs:

Satellites process the 406 signal

CG aircraft can home in on both the 121.5 & 406 MHz signals

Commercial aircraft can usually only home in on the 121.5 Mhz signal

Ensure it's registered...very easy on NOAA web site

Can use comments block as supplementary "float plan"



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406 EPIRB Beacon Types

- 3 Variants:

1. **Maritime** - Emergency Position-Indicating Radio Beacon (EPIRB)
2. **Personal/Land** - Personal Locator Beacon (PLB)
3. **Aviation** - Emergency Locator Transmitter (ELT)

- Manual and/or Automatic Activation

- Frequencies:

- 406 MHz digital signal to satellite
- 121.5 MHz homing (DF) signal for SAR assets



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406 EPIRBs are International

16 Feb 2008



Light Plane Crash

406 Personal Locator
Beacon (PLB) Rescue
British National
75 mi NW of
Puerto Plata, DR

USCG H-60 Helo
Recovery

PLB Registered in New
Zealand



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Info on EPIRBs/ELTs/PLBs from the CG's Program Manager

The CG dials every number on your contact list when they get an alert
...but 50% of the registrations have errors.

EPIRBs/ELTs/PLBs *without* GPS:

An alert generates 2 positions...your real position and a mirror image 3,000 miles away.

Worst case, it can take 8 hours to determine your real position

Therefore, help the CG determine which is right by having good registration info.

Longer times are toward the equator.

The SARSAT system must *hear* your EPIRB 3 times each satellite pass to get a position...and something might mask your EPIRB/ELT/PLB and just the wrong moment.

PLB antennas must be held vertical and out of the water.

EPIRBs/ELTs/PLBs *with* GPS:

Can generate a position in between 1 and 3 minutes!



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Importance of Registration

- We can do a better rescue by being able to call your points of contact.
- We can avoid launching on false alarms by being able to call you.
 - 9 out of 10 alerts are false.
 - 80% of these are resolved by phone.
- Is your registration up-to-date? Update if you:
 - Change contact info
 - Sell the boat or EPIRB
 - Loan your EPIRB
 - Change boating locations
 - Can use comments block as a supplemental “float plan”



Registration

www.beaconregistration.noaa.gov

Address <https://beaconregistration.noaa.gov/rgdb/> Go Links

Google Search Web 403 blocked AutoFill Options

NOAA Satellite and Information Service
National Environmental Satellite, Data, and Information Service (NESDIS)

Search and Rescue
Satellite-aided Tracking

UNITED STATES 406 MHz BEACON REGISTRATION DATABASE SYSTEM

[Need help with this page?](#)

Beacon Owners

Please note that a Beacon ID is required to use the on-line system.

- Click [New Registration](#) to register a new beacon. Also use this option if you have acquired a beacon that was previously registered for a change of ownership.
- Click [Access Beacon Previously Registered By Mail](#) to create a password for your existing beacon registration that was registered by mail. This step only needs to be completed once for each beacon registration.
- Click [Access Beacon](#) to access an existing beacon registration. You will need your beacon ID and a current password to use this option.
- Click [Access Block of Beacons](#) to access a block of existing beacon registrations.
- Click [Create Block Account](#) to create a beacon block user account. Please note that you will need to have at least 3 beacons to create a block account.
- Click [Forms](#) to get electronic versions of beacon registration forms.

Internet



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Other Alternatives

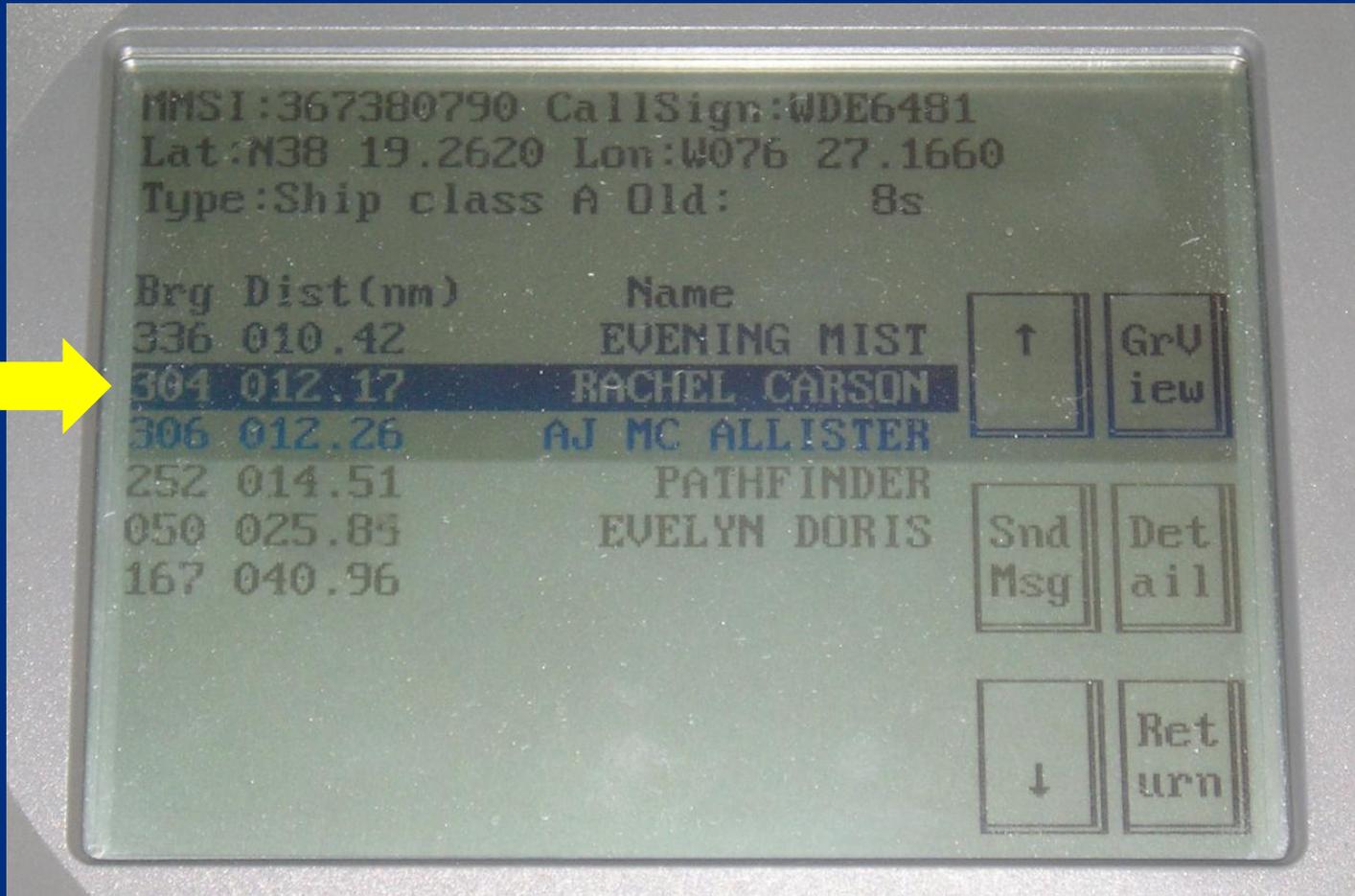
- SPOT...commercial device
 - Pro: Can transmit an “I’m OK” signal, which EPIRBs/PLBs can’t
 - Con: Depends on commercial firm to relay distress call to the CG
- NAVTEX...CG transmission of urgent marine safety info (storms, gales, pirates)
- HF TELEX (also called SITOR or NBDP)...weather forecasts & warnings
- SART...Search & Rescue Transponder; operates in either:
 - 9.2-9.5 GHz frequency band & generates 20 dots on a radar display, or
 - AIS band
- HAM Radio



Automatic Identification System (AIS)

Wonderful & emerging tool

Send and receive, or receive only



AIS

May be confusing by giving too much information in heavy traffic (ie NY Harbor)

...but in these cases, listen and participate in the Vessel Traffic Service if there is one.

...but AIS is FABULOUS offshore and when the traffic is light to moderate.

Merchant vessels much more likely to repond if hailed by name.



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Know Your Ship...



Recommend someone other than the owner/skipper know the location & operation of your SAR comms equipment:

Visual Distress Signals

Sound Signals

VHF-FM Radio

406 EPIRB

Satellite Phone

HF Radio

The further you are offshore, the more crewmembers should be trained.



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Backup comms

If your VHF-FM antenna is at the top of your mast,

Or...

If your HF antenna is part of your standing rigging (commonly backstay),

...What will you do for antennas if you are dismasted?

Or...

...If you Capsize?



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EPIRB rescue 2 Jan 2010...*S/V Gloria Adios*

USCG District 5 (Portsmouth, VA) received a 406 MHz beacon alert 250 miles East of Cape Hatteras at 5:07 PM (it's dark)

Beacon is registered to the 34-ft sailboat *Gloria Adios*

Using the Registration Database, USCG contacted owner's daughter

The daughter didn't know his location but stated he was alone and sailed out of Chesapeake Bay after Christmas, heading to Caribbean

The CG launched a C-130 from Elizabeth City, NC and established VHF-FM comms with Mr. Dennis Clements aboard the vessel at 6:30 PM

The merchant vessel *Ryujin*, participating in AMVER was diverted, but was unable to assist due to the rough weather

The CG worked with the USN 2nd Fleet in Norfolk and determined *USS Eisenhower* was capable, available & closest. *IKE* launched a helo.



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S/V *Gloria Dios* Rescue, continued...

The CG C-130 witnessed the vessel being dismantled via infrared imaging about 9:30 PM

The mast poked 2 holes in the vessel and it started to sink.

The C-130 dropped a raft and supplies. *Gloria Dios* sank.

IKE's H-60 helo arrived after flying 100 miles through a snowstorm and hoisted Mr. Clements at 10:30 PM. Flew him back to *IKE*.

A CG H-60 landed aboard *IKE* and took survivor to Elizabeth City, NC, arriving at 3:45 AM.



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Final Thoughts

CG Sectors Hampton Roads, Woods Hole, & Delaware Bay

If you want this helo to appear overhead or cutter to come over the horizon:

- Have the right gear
- Know how to use it
- Remember we can't DF on SAT or Cell phones
 - Limited ability to triangulate on Cell
- Ensure it's registered
 - MMSI for DSC radios
 - Registration Number for EPIRBs, PLBs & ELTs
- Ensure it's working properly
- Operate it properly
- Speak slowly and clearly

“Preparation equals performance” ADM Loy



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Remember...

Position & PFDs...

Greatly increase the chance we will find you



Sail Safely and Well... See you on the water!



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Presenter & Contact Info

- Captain Kip Louttit, USCG, Retired
- kiplouttit@yahoo.com
- 301-956-0711
- Me & my son, daughter, and dad



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