Search and Rescue Communications

Safety at Sea Seminar

Annapolis, MD
3 April 2016

Captain Kip Louttit
U.S. Coast Guard
Retired & Auxiliary
The Objective: lots of this...
…Not this:

Person on hoist cable
The problem... You are *here*...
…and you want to be *here*: 
SAR Comms will help you get there

Overall Concept…
✓ whatever works best, the CG will use
✓ 2 of the best options…
Agenda

- Overview
- Distress Signals
- Global Maritime Distress & Safety System (GMDSS)
- VHF-FM & MF/HF SSB
  - CG Rescue-21
  - DSC & MMSIs
- SATELLITE PHONES
- EPIRBs
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)
➢ SOS by Morse Code (… ___ …) by horn, flashlight, automatic flashing light
➢ 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 strobe as anchor light Inland*
  ➢ *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!

Captain Kip Louttit, U.S. Coast Guard, Retired & Auxiliary  ©April 2016
Global Maritime Distress and Safety System (GMDSS)

- Components:
  - VHF-FM
  - HF (Single Sideband)
  - 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

Me!
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.
Voice Communications

- **Satellite and Cell Phones**
  - Good and clear
  - Weather/e-mail/web etc.
  - But…
    - No one else can hear you
    - Coast Guard can’t DF on the signal
    - **Handoff between 911 & CG can be poor**

- **VHF-FM and 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
Case Study: Self-Rescue & Sat Phone
Annapolis/Bermuda Race 2008

Air Mail
Great race for 400 miles…

Preventer
Then we lost control...

- Wild ride for a few minutes while we shortened sail
- Found a course we had control... North toward Montauk
- Looked over-the-side...bottom 3 ft. of rudder gone and sides delaminated
- Called CG Atlantic Area Command Center, Portsmouth, VA by Sat. Phone
- CG put us on a 4 hr. then 12 hr. check-in schedule...position, course, speed, weather, ops normal
- Sailed home under #4 jib & reefed main
- “Preparation Equals Performance”
- Self-rescue worked
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)
Rescue-21 Coverage Today

U.S. Coasts, Great Lakes, Virgin Islands, Hawaii, Guam & Northern Marianas Islands done

Western Rivers 2017

Alaska 2017

NOTE: Coverage rings are depicted for illustration purposes only.
NOTE: Inset maps are not to scale with the US mainland.
Pros/Cons of VHF-FM

- **Pros:**
  - Very clear
  - Lots of users and channels
  - Hand-holds very capable

- **Cons**
  - Line-of-sight, so range based on antenna height:
    - 300’ 20 mi
    - 115’ 12 mi
    - 50’ 8 mi
    - 7’ 3 miles
VHF-FM Distress & Working Freqs

- **16 - International Distress, Safety, and Calling**
  - Distress traffic after establishing comms on 16
  - CG Urgent Marine Information Broadcasts

- **22 - CG to Maritime Public working frequency**
  - You to ship, ship to ship, you to real bridges
  - Security broadcasts (can be done on 16 depending on situation)

- **13 - Bridge to Bridge**
  - You to ship, ship to ship, you to real bridges

- **Vessel Traffic Services use variety of freqs…i.e. 11,12, 13 & 14**
  - E.g.: New York: 11, 12 & 14
  - Great for situational awareness
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
What does DSC do?

- Provides a one-touch button for distress
  - The CG will call you back on Channel 16
  - Sounds an alarm on all DSC radios within range
  - Prevents missed distress calls

- Your vessel is identified by unique Maritime Mobile Service Identity (MMSI) number

- Can privately hail other DSC equipped vessels or shore stations
  - Intent to decrease non-emergency radio traffic on emergency channels (i.e. Channel 16)
  - 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)
Maritime Mobile Service Identity number (MMSI)

- **DSC only works if MMSI number entered in the radio**
  - 9 digit number with vessel & owner’s information
  - Like a phone number
  - Unique to your vessel
  - Coast Guard database of MMSIs speeds rescue

- If there is a problem with MMSI number, the radio still works in the normal VHF-FM mode

- **However, without a proper MMSI, automated systems won’t work to identify you and aid rescue**
Getting a MMSI

- It’s free

- Places to get MMSI numbers:
  1. BoatUS, SeaTow, U.S. Power Squadron
     - For Domestic U.S. use only
  2. Federal Communications Commission
     - For International and Commercial use

- Once you obtain your MMSI number, 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
  - Coast Guard: www.navcen.uscg.gov/marcomms/GMDSS
What the CG sees…

MMSI ##

Position

Nature of Distress
Testing DSC Radios

Test transmissions on VHF DSC calling channel 70 should be made to another VHF DSC radio by using a routine individual call to their MMSI.

For VHF DSC radios equipped with the Test Call feature, test transmissions should be made to the Coast Guard MMSI 003669999 to receive an automated VHF DSC test response.

You must use the “Test Call” category of your radio because “Individual” category calls to this address will not receive an automated response.

For older radios not having a test call capability, testing can only be performed by using a routine individual call to their MMSI.

UNDER NO CIRCUMSTANCES SHALL A DSC DISTRESS ALERT BE SENT TO TEST YOUR RADIO. IT IS A VIOLATION OF THE RULES AND CAN RESULT IN HEAVY FINES.

Please consult your owner's manual for the proper operation.
Pros:

- 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 (e.g.: 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
HUGE CHANGE REGARDING HF

- Effective 1 August, 2013, the CG terminated its radio guard of the international voice distress, safety and calling frequency 2182 kHz and the international digital selective calling (DSC) distress and safety frequency 2187.5 kHz.

- Marine info & wx transmitted on 2670 kHz also terminated.

- Now, use the freq appropriate for time of day and your area.

**Distress & Safety Frequencies**

<table>
<thead>
<tr>
<th>VOICE</th>
<th>DSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,187.5 kHz</td>
<td>n/a</td>
</tr>
<tr>
<td>4,207.5 kHz</td>
<td>4,125 kHz</td>
</tr>
<tr>
<td>6,312.0 kHz</td>
<td>6,215 kHz</td>
</tr>
<tr>
<td>8,414.5 kHz</td>
<td>8,291 kHz</td>
</tr>
<tr>
<td>12,577.0 kHz</td>
<td>12,290 kHz</td>
</tr>
<tr>
<td>16,804.5 kHz</td>
<td>16,420 kHz</td>
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</tbody>
</table>

These are all Simplex freqs (xmit/rcv the same)
Radio Rules & Etiquette

▪ After establishing communications on Channel 16 shift to an appropriate working frequency.
  ▪ Do not converse on 16 or do radio checks on 16
    ▪ Sea Tow has radio check function; channel 27 in Annapolis area
▪ 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
▪ If you hear 1 side of a conversation, don’t “step-on” other side
▪ No CB radio or “10 code” lingo
The Distress Call…

- Make sure *radio* is on (not the loud hailer)
- Select Channel 16 VHF-FM or *appropriate HF freq*.
- 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

*(Put Life Jackets On)*
Position Tips

When giving position, 1 decimal place usually plenty:

\[
\begin{align*}
.1 \text{ minute} &= 200 \text{ yards} \\
.01 \text{ minute} &= 20 \text{ yards} \\
.001 \text{ minute} &= 2 \text{ yards}
\end{align*}
\]

Example:

“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.”
When giving your position with respect to another vessel, give your position relative to that vessel... in other words, tell him what direction to look.

“Northbound container ship South of Thomas Point Light this is the Southbound sailing vessel Delphin II 1 mile off your starboard bow, over.

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

Hand held VHF-FM by helm is perfect

Delphin II
Annapolis to Bermuda race
June 2014
EPIRBS, ELTs & PLBs

➢ Total rescues in 2015: 260 people
  
  At Sea: 138 people in 46 incidents
  Aviation: 21 people in 11 incidents
  PLB Land: 91 people in 65 incidents

Total: >39,000 people saved worldwide since 1982; 7,793 in the U.S.

➢ 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 home on the 121.5 MHz signal
Ensure it’s registered…very easy on NOAA web site
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)

• Automatic or Manual Activation

• All EPIRBs float in the right position for transmitting and operation

• PLBs “float”, but not in the right position to transmit and operate
406 MHz EPIRBs/PLBs: Transmits signal to satellites, which alerts rescue forces, worldwide.

- 11 April 07
- S/V Paradox
- CG 1504

150nm Southwest of St. Pete, FL

C-130 at 10,000 ft... DF locked on at 15 miles

Paradox Classic Tactic...fixed wing up high & helo down low
Example 2014 EPIRB Cases

6 March 2014
91 miles Southwest of Bermuda
S/V Bull sinking with 2 POB
USCG diverted
AMVER vessel Crown Sapphire
Crown Sapphire took the 2 people onboard and continued to Baltimore

15 May 2014
1,060 miles Northeast of Bermuda
S/V with 3 POB
USCG aircraft flew to scene and dropped a life raft
Crew abandoned ship into the life raft
CG Aircraft contacted a nearby fishing vessel which took the people aboard and then to the Canary Islands
Example 2015 PLB Cases

15 February 2015
260 miles East of Atlantic City
S/V Sedona stranded with 2 POB
Helo flew to the scene, hoisted both hypothermic people, and flew them to CG Air Station Cape Cod

30 January 2015
345 miles East of Wilmington
S/V Rainmaker with 5 POB
Dismasted and engine failure
Helo flew to the scene and hoisted all 5 people.
Flew to Dare County Regional Airport, Wilmington, N.C.
Personal Case of PLB use… July 2015
Medevac of 15 Year Old Boy Scout with Mild High Altitude Pulmonary Edema (HAPE), Mount Whitney, CA (14,495’)

[Images of hikers and a Coast Guard flag]

Homeland Security

Captain Kip Louttit, U.S. Coast Guard, Retired & Auxiliary ©April 2016 38
Rescue command post on a rock

Made HAPE diagnosis using 2 first aid books & Wilderness 1st Aid Training.

Called the Coast Guard, California Office of Emergency Services, Sequoia National Park, and Parents on Satellite Phone.

Directed to activate PLB to confirm position.
Help arrived…Ranger on foot…paramedic by helo

Marked safe helo landing site with orange poncho. Chair carry of scout to helo. 15 minute flight to hospital. Scout fine once at lower altitude.
406 EPIRBs are International

16 Feb 2008

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

Light Plane Crash
Info on EPIRBs/ELT/PLBs from CG Program Manager

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

- PLB antennas must be held vertical & out of water

- Newer EPIRBs/ELT/PLBs with GPS can generate a position in between 1 and 3 minutes
  - Old EPIRBs without GPS could take 8 hours
Importance of Registration

- CG can do a better rescue calling your points of contact
- CG 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
  - Your contact(s) will be out of contact!
  - Sell the boat or EPIRB
  - Loan your EPIRB or change boating locations
  - Change your “additional data” comments

www.beaconregistration.noaa.gov
Recommended use of “Additional Data” block

Provide “Float Plan” type info...

✓ Vessel description, POB, route, ETA, etc.
✓ My generic entry below.
✓ Update for ocean passages, Mt. Whitney backpacking, etc.

Valiant 40 “Flight”
Florida to Annapolis delivery May 2015

Additional Data

PLB owner is retired CG CAPT & Exec Director of Marine Exchange of SoCal (VTS LA/LB). Sail 19' blue/white sloop & 14' blue/white Laser, 9' white sailing dinghy & yellow/red kayaks; and Boy Scout backpacking/hikes in Los Angeles/SoCal/Catalina area.

Emergency Contact Information (Please indicate someone other than the owner)
* Name of Primary 24-Hour Emergency Contact
Wendy Louttit (Wife)
Other COMMS Alternatives

- **SPOT**...commercial device
  - Pro: Can transmit an “I’m OK” signal
  - Con: Depends on commercial firm to relay distress call to CG

- **NAVTEX** (Navigational Telex)
  - CG & International transmission of urgent marine safety info (storms, gales, pirates)

- **HF TELEX** (also called SITOR or NBDP)
  - Weather forecasts/warnings, HydroLants/Pacs (rocket launches)

- **SART**...Search & Rescue Transponder; shows on radar as 20 dots

- **HAM Radio**
Automatic Identification System (AIS)
Wonderful tool
Send and receive, or receive only
Automated Identification System

▪ **Advantages:**
  ▪ Situational awareness of traffic
  ▪ Ability to call ships by name
    ▪ Merchant vessels much more likely to respond if called by name

▪ **Limitations**
  ▪ May be confusing by giving *too much* information in heavy traffic (i.e. approaches to Hampton Roads or NY). Therefore:
    ▪ Use filters
    ▪ Reduce range
    ▪ Listen to Vessel Traffic Service if there is one

▪ AIS Person Overboard Device
Class A or B AIS as seen by a ship or vessel traffic service
White = Class A
Blue = Class B

VTS Los Angeles & Long Beach traffic control screen.
Know Your Boat

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

Visual Distress Signals
Sound Signals
VHF-FM & HF/SSB Radio
AIS
406 EPIRB
Satellite Phone

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

Non-comms but critical: PFDs, Fire Extinguishers & Liferaft
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?
**Rules & Legal Requirements**

- **International Sailing Federation (ISAF):**
  
  "1. **SAFETY**

  "1.1 Helping Those in Danger: A boat or competitor shall give all possible help to any person or vessel in danger."

- **Safety of Life at Sea (SOLAS) obligations:**
  
  - Assistance: All ship and aircraft commanders have an obligation to assist those in danger of being lost at sea
  
  - Communications: GMDSS requires passenger and cargo ships to:
    
    - Carry radio equipment including EPIRBs and SARTs
    - Prior to sailing, ships must log that:
      
      - GMDSS safety and communications equipment is in an efficient working condition including reserve source of energy

*Takeaway: Test your gear & check spare batteries. Use test function of EPIRBs/PLBs and check stickers for remaining battery life*

- **Moral imperative**
Giving assistance

- Use GREAT Caution when maneuvering close to a sinking vessel
  - Keep other vessel and shore SAR assets informed
  - Be prepared to recover people from the vessel, life raft, water, or some combination of all 3
  - Ensure you account for everyone, especially if there are multiple rescue assets
  - Use caution for debris/lines/rigging in the water
  - Approach from upwind if other vessel is on fire (stay out of the smoke)

- Understand that a yacht or other “good Samaritan” vessel may be the only source of help

- “Mayday Relay” – you pass on another vessel’s Mayday call

- Per SOLAS, merchant ships must carry International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual
  - AMVER
  - Masts/spreaders of sailboats and sides of ships to not mix
Search Patterns

- Expanding Square: concentrated search of small area
  - Assume Drift to East (090)
  - 120 degree turns
  - 200 yard track spacing for PIW. At 6 kts, X=1 minute

- Sector Search: concentrated search of small area with well known datum

- Parallel: uniform coverage where approximate position is not well known

- Creeping Line: uniform coverage when coverage of one end of search area is desired 1st

= datum
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.
S/V Gloria Dios Rescue, continued…

The CG C-130 witnessed the vessel being dismasted 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.
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
• CG can’t DF on SAT/Cell phones
  • Limited ability to triangulate on Cell
• Ensure it’s registered
  • MMSI for DSC radios
  • Registration ## for EPIRBs/PLBs
• Ensure it’s working properly
• Operate it properly
• Speak slowly and clearly
Sail & Race Safely & Well…
See you on the water!

Remember…
Position & PFDs…
Greatly increase the chance of a successful rescue
Presenter & Contact Info

- Captain Kip Louttit, USCG, Retired
- kiplouttit@yahoo.com
- 310-897-1714
- Me & my son, daughter, and dad
Thoughts from the SAR Controller

• Have a plan. Think of the what you will do in different scenarios. Share your voyage plan in the form of a float plan with a friend of family member.

• Have multiple forms of communications to send out a distress, i.e. VHF Radio, VHF-DSC, EPIRB, MF/HF Radio, or SAT phone. Don’t depend on just one, especially a Cell phone.

• Ensure your equipment is maintained, registered properly and you know how to use it.

• Wear your Personal Floatation Device (PFD) whenever you are on the water. If you go into the water unexpectedly you could be hurt or unconscious and your PFD could save your life.
Resources

Float Plans online:

VHF-DSC Registrations:
http://www.boatus.com/mmsi
http://www.seatow.com/mmsi
http://www.usps.org/php/mmsi
**http://wireless.fcc.gov/services/index.htm?job=licensing&id=ship_stations
**Must get your MMSI from the FCC for it to be recognized overseas

EPIRB Registrations:
http://www.beaconregistration.noaa.gov/

USCG Boating Safety Website:
http://www.uscgboating.org/

Free Vessel Safety Examination:
http://wow.uscgaux.info/content.php?unit=V-DEPT&category=i-want-a-vsc
The big 6 that get you in trouble...

1. Cold
2. Wet
3. Tired
4. Hungry
5. Scared
6. Seasick

Case Resolved by a good VHF-FM Mayday Call
Case Study: Outside Assistance
Big 6 & Cascading Casualties…

▪ June 1991
▪ Pearson 34
▪ 2 Couples from Philadelphia … 3 sailors … 1 non-sailor
▪ 2 Week vacation
▪ Plan: Cape May to Block Island in 1 leg; multiple stop return
▪ Weather: Departed Cape May into Nor’Easter
▪ 24 Hours Later…”Mayday Mayday Mayday Mayday…We’ve blown out our sails, the engine won’t start, and we’re sinking!”
The Cascade...

- ¾ crew sick…only one not sick was the non-sailor
- No one made rounds below and checked bilge
- No one ate or slept
- Reefed Main…Improperly
  - Reef points tighter than clew…ripped out the reef points
- Tried to start engine…wouldn't start
- Looked at engine and found water in bilge…we’re sinking!
- “Mayday Mayday Mayday”
Initial CG actions

- CGC HARRIET LANE (270’ w/ 100 crew)
- Sent over a machinery technician and electrician
- Found a cockpit drain hose had come off, which let cockpit water pour on the engine
- A little magic with spray electrical drier and engine start spray
- Engine started...
- “OK skipper, no more flooding, we fixed the hose, we pumped the bilge, the engine is running, we furled your sail, your electronics work…she’s all yours…”
- “PLEASE, TAKE US TO SHORE…”
Final CG actions & Impact of *Big 6*…

- CG Options…(1) Tow her or (2) we crew her
- We chose #2...I was XO (LCDR) & went over with an Ensign
- Sent all 4 to bed with water/crackers
- Put *Jimmy Buffet* on stereo
- Double reefed main (above rip) & unrolled the jib
- 7 knots on a reach toward Long Island
- **6-8 hrs. later the crew came alive...**
- We were relieved by CG small boat from Shinnecock
- *Guard against cold, wet, tired, hungry, scared & sick*
END