Catalina 350



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Recently it occurred to me that there are plenty of subjects that deal with boating that are not necessarily specific to one brand or model. So I decided to try to find some boaters who were knowledgeable on one of these other subjects and ask them to write a paper for *Mainsheet*. Then I came to the realization that one of these people was right under my nose – our C350 Commodore, Andy Sumberg. In presenting my idea to Andy, I learned that he teaches a GPS course for the US Power Squadron and is also very knowledgeable not only on that subject, but on Digital Selective Calling (DSC) and on Rescue 21, the US Coast Guard's communications system, as well.

Andy was kind enough to impart some of his expertise in the following article. I think you'll find it interesting and valuable.

Also for this issue, Dave Brown has come up with a very simple but yet very useful idea that I think might be of interest. We hope you enjoy both articles. *–Skip*

Digital Selective Calling (DSC) and the Coast Guard's Rescue 21

Have you ever heard of DSC VHF Marine Radio? Do you know what it does? DSC stands for Digital Selective Calling and it may well change the way you use your marine radio. It will certainly change the way you get help in an emergency. DSC offers boaters an array of technology upgrades for marine communications. DSC is designed to work in tandem with Rescue 21, the new United States Coast Guard command, control and communications system. Before delving into DSC, some background on Rescue 21 is in order. According to the Rescue 21 website Rescue 21 is "the leading edge command, control, and communications system that will improve the ability of the Coast Guard to meet its Search and Rescue and Homeland Security missions."

When fully implemented, the Rescue 21 project will become, "the Coast Guard's primary system to receive distress calls from boats and ships, and perform command, control and communications in the inland and coastal zones for all Coast Guard mission areas." Now a $730 million project, command and control needs were identified following a 1995 study recommending significant

updates for the existing National Distress and Response System . Between 1995 and 2002 studies and pilot projects were conducted, resulting in advanced system specifications. Rescue 21 (initially called the National Distress and Response System Modernization Project (NDRMSP)), now provides the following capabilities:

Direction-finding. New towers and antenna facilitate rapid triangulation giving Coast Guard watchstanders the position of an originating radio call in real-time. In a minimum coverage area where triangulation is not possible, a line of position to the caller dramatically reduces the search area for Coast Guard crews and improve your chances of a speedy rescue.

Improved interoperability amongst federal, state, and local agencies. Much has been said about how the first responders (police, fire, city, state, and federal emergency personnel) were unable to communicate with each other on Sept. 11, 2001. Rescue 21 system enables first responders and law enforcement agencies to communicate in real time, during a crisis.

Simultaneous channel monitoring. New equipment expands the number of channels watchstanders can monitor from one to six, virtually ensuring your call will get through.

Digital playback and recording of calls. Digital archiving (recording) with enhanced playback capability allows watchstanders to enhance and replay garbled distress calls. While, by all accounts, the legacy system performed well for three decades, this digital technology upgrade will dramatically reduce lost calls.

Reduces coverage gaps. The elimination of eighty-eight known coverage gaps in coastal areas throughout the US improves your chances of being heard. These is accomplished by increased antenna strength, better antenna placement, and in some cases, the addition of towers.

Identification of hoax calls. Rescue 21's direction finding allows the Coast Guard to identify hoax calls emanating from inland areas. According to Rescue 21 spokeswoman Judy Silverstein, that too helps watchstanders prioritize calls, efficiently plan for the real emergencies and necessary rescues and ensure resources are efficiently allocated to the real cases. The Coast Guard spends nearly $2 million annually on hoax calls. "Clearly, the Rescue 21 system can help us save lives and improve response planning, but by identifying a hoax call, we can also save valuable time and money for the real emergencies," Silverstein said. "When lives are at stake, information provided by lines of bearing becomes a critical part of a search and rescue toolkit."

Provides portable towers. During an emergency, a tower may be obliterated. That was the case following the devastation wrought by Hurricane Katrina, in 2005. "The Disaster Recovery System (DRS) allows us to resume communications quickly following a natural or man-made disaster," said Silverstein of Rescue 21's fully portable, temporary deployable towers.. "Our philosophy encompasses both response and recovery following a disaster," she said. The DRS allows for recovery of Command, Control, and Communication (C3) capability in the aftermath of mud slides, ice storms, hurricanes, tornados.

Supports Digital Selective Calling (DSC). While Rescue 21 and DSC enhance command and control capabilities for the Coast Guard, DSC is what is most visible to us as boaters. While DSC implementation was conceived for emergency use, there are also a number of important non-emergency uses for DSC

Figures 1 shows a schematic of the Rescue 21 system (courtesy of General Dynamics). When a distress call is received direction finding (DF) equipment from one or more high sites computes the direction from which the signal originated, or line of bearing (LOB). Two LOBs allow a position to be determined by triangulation. The distress audio and position (or LOB) is sent to the closest Coast Guard ground center. Appropriate resources are dispatched to respond immediately, even across Coast Guard regional boundaries.

Figure 2 shows a portable disaster recovery tower in transport mode. When in position the tower is tilted upright and then extended to full height. Disaster recovery sites include towers, portable power generation, and satellite dish transmitter/receivers that fully integrate the unit into the Coast Guard Rescue 21 system via satellite link.



Digital Selective Calling (DSC). So … What is Digital Selective Calling? DSC technology allows you to use your marine radio more like a telephone. Your radio conversations will not be private, but, through the miracle of digital electronics, you will be able to specifically call one or more boats if you and they have properly configured DSC marine radios. You can also place an automated emergency call to the Coast Guard simply by pressing one button. There are three components to a "properly" configured DSC system: a DSC capable radio, an MMSI number, and a two wire connection to your GPS.

DSC Marine radios on the market meet one of three class standards, Class A, International Class D, and Class SC-101 (also called US Class D). Class A is the most expensive, starting at about $800. It is a dual tuner radio that can receive a DSC call, whether the oper-



ator is transmitting, receiving, or on standby mode. Naturally, the radio must be turned on. Class A radios are now required on commercial vessels. International Class D radios also have dual tuners but will not receive a DSC call when transmitting. If receiving or on standby mode the radio can receive a DSC call. Class D's are much less expensive starting at around $200. Class SC-101 radios have a single transmitter and will only receive a DSC call if it is in stand-by mode, not transmitting or receiving. An SC-101 can be purchased for as little as $130.

Figure 3 shows a DSC capable VHF marine radio (courtesy of Standard/ Horizon Electronics). Note the red door covering the distress button. The boats position is shown on the radio's display. The satellite icon in the upper right corner of the display shows the radio is actively receiving GPS data. By the way, the position shown on the display (L 33° 37.120'N, Lo 118° 09.582'W) is located in the Pacific Ocean 13 miles west of Newport Beach and 11 miles south of Long Beach, CA.



MMSI stands for Marine Mobile Service Identity. It is a nine-digit number, similar to a phone number, which uniquely identifies you. It is available free of charge and can be obtained via links from Boat/US, Seatow, or directly from the US Federal Communications Commission. When you apply for your MMSI number, you provide contact information about the registered owner, emergency contact information, and vessel identity information such as the length, color and make of your boat. This information is maintained in a registry and the Coast Guard can access a database containing this information when you place an emergency call.

When you obtain your MMSI number, enter it into the radio by following the instructions in the radio's owner's manual. One note of caution, most commercially available models only allow you to program your user (station) MMSI twice. If you exceed that number, you will have to send the unit back to the factory for a reset. After you enter the MMSI number, double check it for accuracy before pressing the ENTER button.

Connecting a GPS to the DSC radio completes the installation. This is a two-wire NMEA connection, using the most common GPS data exchange format. Once again, your GPS and DSC radio owner's manuals will explain how to do this. Or, you can call a USCG Auxiliary unit for free assistance in hooking it up.

DSC is a hailing system. It is used to efficiently hail other boats or the Coast Guard, for either emergency or non-emergency purposes. The DSC hailing signal is a short digital message – about 0.3 seconds in length and it is always transmitted on channel 70. Channel 70 is now reserved for only these digital transmissions. DSC equipped radios will not allow voice calls on channel 70, while older radios may. It is illegal to have a voice conversation on channel 70, according to FCC regulations.

Non-emergency DSC calling. While the DSC functions of various radios may differ, I have run into three types of DSC calls: individual, group, and all ships. "Individual" and "group" calls can be made to boats within receiving range as long as their MMSI numbers have been saved in the directory of your DSC radio. When you enter someone's MMSI you also include a name so the radio's directory shows a list of recognizable names, not just a series of nine-digit numbers. The difference between individual and group calls are the number of names (MMSIs) you select when making the call. To make an individual or group call set the radio to the channel on which you would like to have the conversation – for example channel 68. Select the individual or group members from the radio's directory and then press the "SEND" button. A digital hailing signal is sent on Channel 70. This signal includes the MMSI(s) of the boat(s) you are calling. DSC radios will ignore the signal unless their MMSI is included in the message. When a designated radio receives the message, it will emit an auditory signal, display the calling MMSI (and name of the calling boat if listed in the receiving radio) and switch to the chosen working channel, which in this case channel 68. At this point a regular radio conversation can commence. An "all ships" call works the same way, except any DSC radio in range will receive the call and under normal circumstances switch to the designated working channel. Individual boat owners can disable the automatic channel switching function. On many radios it is also possible to "tag" the call with a topic - Emergency, Safety, or Routine – selected when making the call, so that the operator receiving the DSC hail can read their radio display to determine the nature of the call.

Emergency DSC Calling. DSC radios have a dedicated button (usually covered by a red plastic door) labeled DISTRESS. Do not test this button! The operator makes an emergency call simply by pressing the distress button for five seconds. This emergency distress call may be heard by any DSC equipped radio, including boaters with DSC radios, Coast Guard boats (and planes) and, when Rescue 21 operational, Coast Guard ground stations. Any receiving DSC radio display will indicate an emergency, show the Lat/Lon position of the calling boat, and automatically switch the receiving radio to channel 16. Upon receiving a DSC distress call Rescue 21 implemented Coast Guard ground stations will digitally acknowledge the call and force the calling DSC radio to channel 16 to initiate a conversation.

If you receive a distress call, listen for Coast Guard acknowledgement of the call on channel 16. If after two minutes no acknowledgement is heard, call the Coast Guard and inform them of the distress call. Your radio will automatically store the MMSI and Lat/Lon of the calling vessel as well as the time of the emergency call. You should also determine your distance from the vessel in distress. You may be in a position to provide assistance.

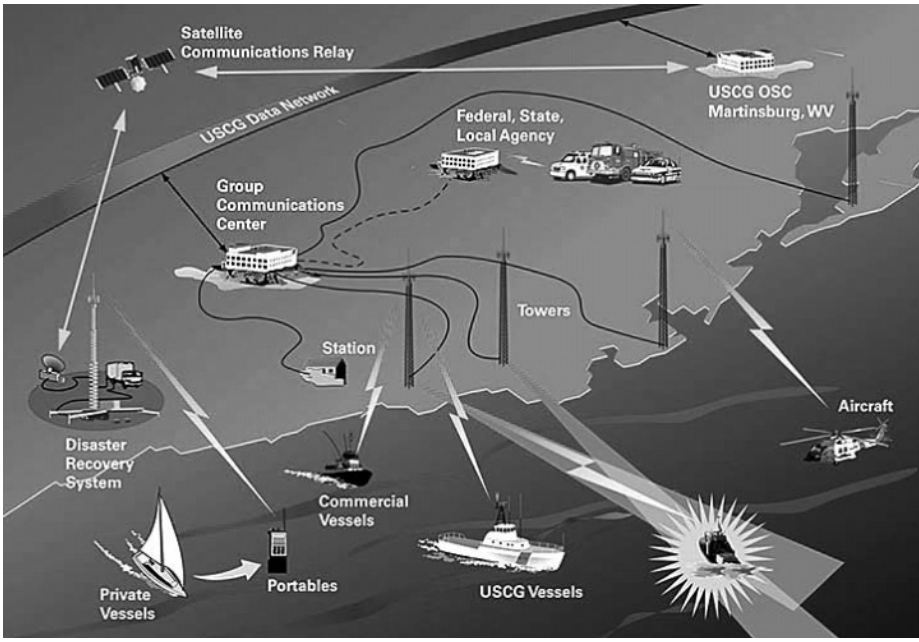
Other DSC features. Most DSC radios have the ability to request the position (Lat/Lon) of another DSC equipped boat. You can set up your radio to automatically provide this information when requested or to "ask" you whether you want to transmit this information every time a request is received. Many radios allow emergency calls to be designated, that is, tagged with a "subject" selected from a menu. Subjects include: abandoning ship, capsizing, collision, disabled, explosion, fire, flooding, grounding, listing, man overboard, piracy, and sinking. These designations allow for voiceless, data transmission in an emergency, where seconds count.

Rescue 21 Implementation. Rescue 21 is currently being implemented in stages throughout the nation. Once Rescue 21 is fully rolled out over the next few years Coast Guard boats and aircraft – should have DSC radios. While these radios do not have the same capabilities as the Coast Guard Opera-

tions Centers,, they will operate very much like the high-end commercially available (Class A) DSC radios.

To date, Rescue 21 stands the watch along 2,200 miles of coastline. The system has been implemented in Atlantic City, New Jersey; Eastern Shore, (Virginia, Maryland & Delaware); Mobile, Alabama; St. Petersburg, Florida; Seattle and Port Angeles, Washington and in a portion of New Orleans, Louisiana; with approximately 36 more installations scheduled. "Rescue 21 is a critical tool for search and rescue, maritime homeland security and marine environmental protection", said Silverstein. "For watchstanders and boaters, direction-finding technology offers a pretty remarkable tool for improving your safety on the water, especially in the case of an emergency," she said. "The Coast Guard feels proper radio use, a DSC radio enabled with GPS and a registered MMSI number, increase the functionality of Rescue 21."

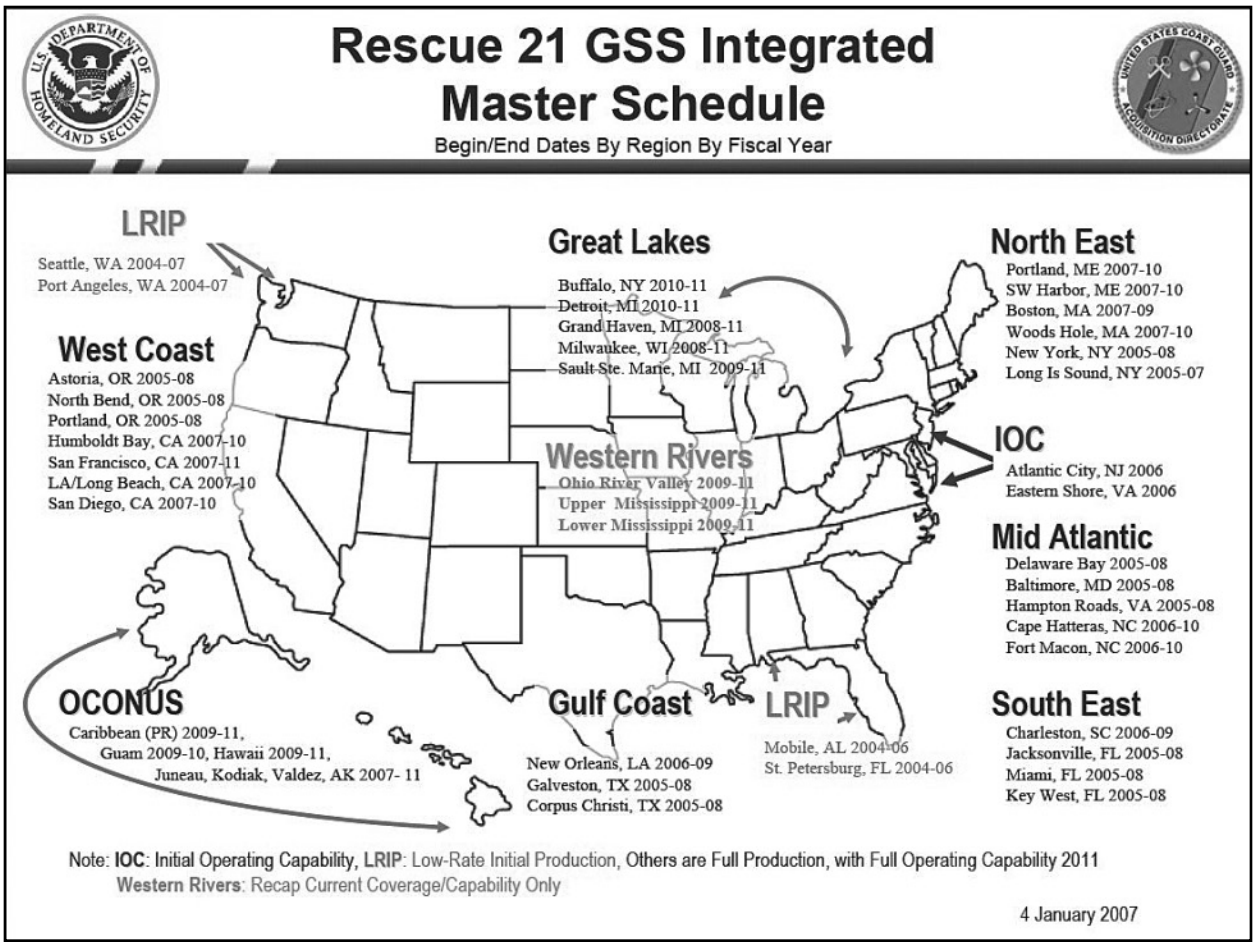
Until Rescue 21 is operational in your area, both non-emergency and emergency DSC calls can still be initiated. Other boats with DSC radios (including Coast Guard vessels) will be able to receive calls. To communicate directly with a Coast Guard ground station, it is best to initiate a call the old fashioned way; hailing by voice on channel 16.



The major advantage of DSC is its ability to send an automatic and prolonged "Mayday" call in the event of an emergency. Therefore, properly installing DSC is more than worthwhile.

Figure 4 shows the Rescue 21 implementation schedule as of January 2007.

The "IOC" and "LRIP" installations are the first to be completed. The term LRIP (Low-Rate Initial Production) refers to the implementation, not the capability of the system. Both the IOC and LRIP installations are fully capable and operationally, no different from the "Full Production" systems. The dates on the figure are US federal



government fiscal years. For example, October 1, 2006 through September 30, 2007 is FY 2007.

Success Story, three lives saved! Rescue 21's first operational success was on November 12, 2005. As reported by Chuck Husick for Yachting Magazine in March 2006.

"A further demonstration of the value of Rescue 21 and its automatic direction finding capability occurred November 15, 2005, when a channel 16 Mayday call was received at the Chincoteague, Va., Rescue 21 station from a sinking fishing boat in the vicinity of Ocean City, Md. The vessel's position was determined by Rescue 21's direction-finding system to be some three miles from its reported position. The correct position information made it possible for Coast Guard rescuers to arrive in time to remove three men from the cold water before hypothermia set in."

Additional Resource: The best informational resource I've found on DSC radio is an interactive tutorial on Boat/US Foundation's web site. Check it out at www.boatus.com/foundation/dsc/player.html. You can also visit this USCG Auxiliary website for information on DSC radios and MMSI numbers at www.sectorsandiegoauxiliary.us/MembersPages/Div16MCMDept.htm. An Internet search will list other links.

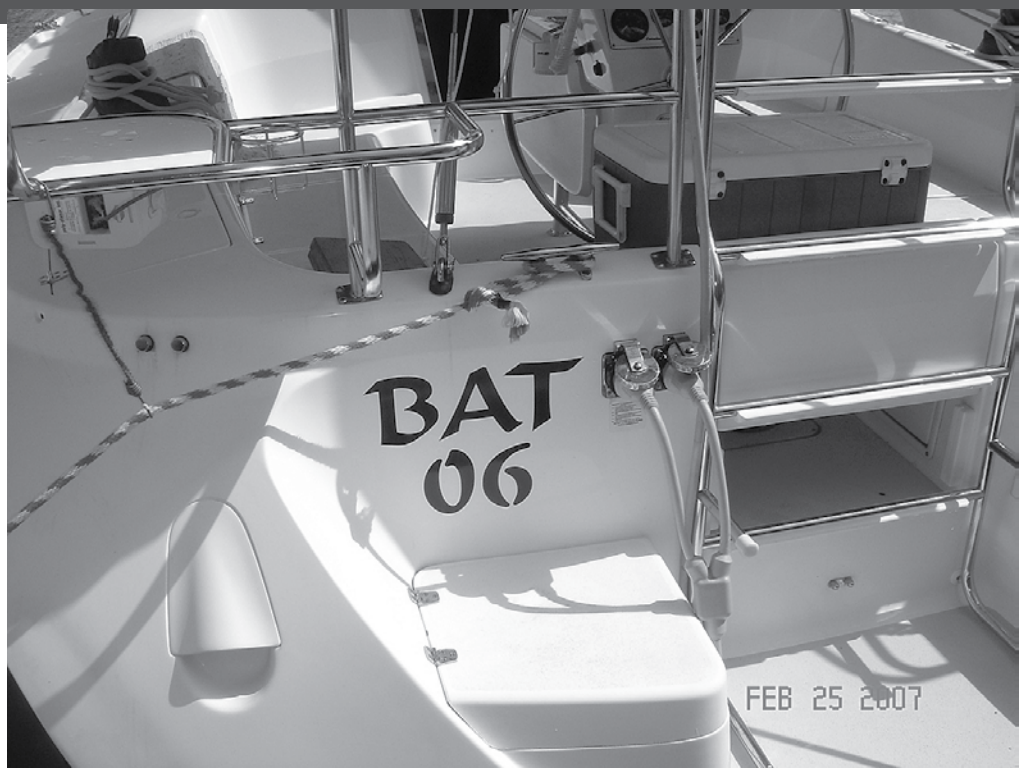
Please feel free to call me any time. My MMSI is 338036681.

More on obtaining an MMSI

There are two paths to obtaining an MMSI and (to the best of my knowledge) three places to get them.

You must obtain your MMSI from the FCC if you meet any of the following conditions: 1) your boat is 65.5 ft or more in length, 2) you boat outside of US territorial waters, or 3) you otherwise require a radio station license (which would be the case if you also have Single Side Band (SSB) radio. The FCC's MMSI database is accessible to the US Coast Guard and agencies of other countries. For more information go to http://www.fcc.gov

If you do not meet any of the above requirements, you may obtain an MMSI on-line from Boat/US at http://www.boatus.com/mmsi, by calling 800-563-1536, OR on-line from Sea Tow at http://www.seatow.com. At this time, data is NOT shared with agencies from other countries, including Canada, Mexico, and the Bahamas.



Aft Cleats

I like to cross-tie stern lines to pilings to allow my boat to ride up and down with the tide more easily so I decided to install cleats on the transom. In order to make it a little easier to get a line secured on them, I decided to use a smaller size than the ones that are normally installed on the boat so I used cleats with 8-inch horns.

I found a good set at West Marine for about $30 each. I very carefully measured the spot I wanted to place the cleats to make sure they would fit before I drilled any holes.

I fastened them with a set of stainless bolts and backed by a 6" X 2-1/2" by 3/4"block of wood. It's very important to take precise measurements not only to ensure that the cleat you select will fit where you want it on the transom, but also that the position will allow the wood backplate to properly fit up into the transom wall. Also, due to the slope of the transom, it's necessary to use bolts that are the right length – long enough to go through the backing block but short enough to get them all the way in before they hit the side of the cockpit wall. Two-inch bolts worked well for me. I caulked the bolts and the base of the cleat before tightening them down to assure a watertight seal. I found this to be a fairly quick and easy process that now allows me to tie off my boat in a way in which I am most comfortable. *–Dave Brown, Hull #246,* Bat 06

