The Cruising Club of America

OFFSHORE COMMUNICATIONS

MEMORANDUM

Version 2.03

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www.cruisingclub.org

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Note: Reference to a commercial product or service does not imply any endorsement by the Cruising Club of America as to function or suitability for any purpose or environment.

Addendum and Corrections:

Name Change for NOAA's Marine Prediction Center to Ocean Prediction Center
Typos & minor corrections

FOREWORD

We bought our first Marine Single Side Band (SSB) radio for a race to Bermuda in 1993. The preparation time and effort required to get the boat ready exceeded what I had anticipated and we left with the thought we would learn how to use this complicated device while underway. That worked well enough to get by, but not to the point where I could feel comfortable with it.

Things were no better a year later when we headed south to the Caribbean. This time the concern was with what to do with the SSB now that we understood how it worked. Various magazine articles about SSB listed frequencies and usage discussions were inadequate. These articles although well intentioned, were often in conflict with similar articles in other magazines and sometimes even latter issues of the same magazine.

It became apparent as our cruising continued that what to do with the SSB was a concern shared by many yachtsmen.

In little steps, this led from listings of frequencies on my chart table to this paper. It is intended to assist in preparing for communications and weather reception during an offshore passage and to serve as a working reference for the yachtsman while on the high seas. It focuses mainly on the use of Marine Single Sideband Radio (SSB), the primary communications tool at this time, omitting theory, installation and so forth available elsewhere.

The orientation of the original Memorandum posted to the web in 2002 was outward bound from North America and included a little material about Bermuda and the Caribbean. Recognizing that cruisers can be in almost any part of the world these days, the scope has been expanded to include other cruising areas in various degrees. Particular emphasis on Europe has been included in recognition of pending CCA cruises there.

With expanded coverage, it has been necessary to divide this revision into two parts. The primary paper, the Memorandum, now deals with safety, weather, communication systems such as Navtex, RTTY, notes on yacht navigation and yacht communications in Europe, etc.

The Appendix contains listings and table data such as authorized SSB frequencies, Nets (both marine SSB and Ham), weather fax schedules for North America and Europe, the RTTY schedule for Hamburg, Germany, an extended listing of Navtex stations, Airmail Stations, Sea Area Charts, VOA and BBC broadcasting schedules, Conversion Tables and so on.

A few notes apply to this paper and the Appendix:

1. All frequencies and SSB modes described are kHz and USB unless otherwise noted.

2. Although Ham radios and other equipment operate in single sideband mode, SSB throughout this paper pertains to Marine Single Sideband Radios.

3. Schedules, frequencies, websites and the like were current at year end 2003. Changes do occur particularly with volunteer nets which should be verified before casting off. NOAA's name change from Marine Prediction Center to Ocean Prediction Center resulted in a revision to all the URLs for this important weather center.

4. Greenwich Mean Time (GMT), Coordinated Universal Time (UTC) and Zulu (Z) are used interchangeably throughout to remain consistent with the various agencies and sources.

5. The International Telegraphic Union (ITU) is a UN body located at Geneva, Switzerland responsible for regulating radio usage including frequency and channel allocations. The US along with most maritime countries is party to treaties supporting these regulations. They are promulgated in the US by the Federal Communications Commission (FCC) and administered by various agencies. The US Coast Guard has responsibility for maritime applications.

6. It has been suggested that an index be added. Actually, a facility in Adobe Acrobat is available for this. Simply click on "Edit" on the Tool Bar, then "Find" and type in the reference word. The program will do the rest.

7. Downloading this paper to a computer running on Windows requires Acrobat Reader Version 5.0 or higher. This version was released prior to Windows XP however and while the display will appear correct on computers running Windows XP, printing it out requires Acrobat Version 6.0 or better (available free at this website).

8. Margins, top and bottom, left and right have been set as follows:

   a. Top and bottom – 1.0”
   b. Left and right – 0.6”
   c. Header and footer – 0.5”

9. It would be nice to have each section continuous without gaps and major sections start on a new page. As it works out, tables don’t lend themselves to this and there are some resulting spaces and minor compressions.

10. Every URL in this paper has been confirmed at the time of posting.

11. In early March 2004, there were over 4,300 downloads (not hits) of this paper. Thanks for your endorsement.

My thanks to CCA Fleet Surgeon Garry Fischer, Stan Honey and Steven Thing for their comments and contributions and a special thanks to Peter Price of the Royal Cruising Club for his insight and guidance on converting these papers to Acrobat. Also thanks to those readers with sharp eyes who have taken the time to write about corrections.

Clearly, this material is not all inclusive and is dated by its nature. It was current in the winter of 2003 - 2004. Readers who learn of meaningful changes are asked to forward these for future updates as has been done in this version. Suggestions on how to improve this paper along with corrections and comments are most welcomed. By all means, the latest version should always be consulted.

Best wishes for fair winds and good sailing.

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CCA

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1 General

Radio Communication via VHF Channel 16 is used to hail US coastal stations and other yachts within 25 miles. The use of Channel 9 in some US coastal areas for this purpose has been discontinued.

Cell or mobile phones are in widespread use. Unfortunately, they are limited by the distance to the antenna which can be constrained at sea due to reception/transmission patterns. There are exceptions to this but usually, going off soundings puts the phones out of range. This is further limited in some places by directional antennas blanking out the "at-sea" areas. In Europe where much of the cruising is of a coastal nature, cell phones work very well.

Farther offshore and with greater distances involved, Single Side Band (SSB) radio is used for ship to ship communications with merchant vessels and yachts, to receive weather faxes, voice and text weather broadcasts, to send and receive e-mail and to communicate with Coast Guards and other authorities.

While there is intent to migrate to the Global Marine Distress and Safety System (GMDSS) in the US by 2006 (discussed later), it is not a requirement for US flagged vessels in US waters at this time. It has been implemented in Europe and many other countries and therefore is onboard most transoceanic merchant vessels. Digital Selective Calling (DSC) on VHF is also not implemented in the US and only partially in many European countries.

VHF 16 still seems to work at sea with merchant vessels and VHF 6 for fishing in many places.

Most VHF radios can be switched from US to International channels. In International mode, the frequencies for certain channels differ from those of the US; some US simplex channels are duplex in the International mode. For example, Bermuda uses Channel 7 International (duplex) for its long range repeater whereas in the US, Channel 7 is simplex and won't work on this neat facility. The UK and Ireland use Channel 37 for many port operations and sailboat race administration which is not normally available on US radios. Canada has some unique channels as well.

Manufacturer representatives can usually reprogram these units.

2 Satellite Communications

Satellite services are gaining acceptance on board yachts at sea. They provide service effectively identical to that available on land via the telephone. With text capability, they can and do extend into the Internet. Excellent results are achieved and the equipment is now smaller, more user friendly and less expensive to purchase although still not inexpensive to use.

Many countries including the US broadcast marine weather forecasts in English via Inmarsat systems (and Navtex discussed later) to fulfill treaty obligations. These broadcasts are in English or in some cases, both the local language and English and take on great importance when cruising in foreign waters.

Typically, there is no charge to receive Inmarsat C weather forecasts. However, the charges for routine correspondence can be significant. One user estimates email cost at about one cent per character (including spaces). To put this into perspective, one of these pages as initially drafted contained 2,850 characters and spaces. At a penny a character if that is a correct yardstick, that one page alone cost about US$ 28.50. Where the density of a page is greater due to smaller print, the cost can be expected to increase proportionally. Caveat emptor.

Inmarsat C is the smallest and least expensive Inmarsat system at a current cost of about $3,000. It has an antenna about the size of a grapefruit. This is a text only service meaning no voice service. It can receive free text weather forecasts worldwide and is integrated into the worldwide GMDSS system for emergency communications. Many Inmarsat C's include a GPS or accept GPS input that enables transmission of distress messages with the yacht's position into the GMDSS system.

The Mini-M is a slightly larger Inmarsat system intended for larger yachts with worldwide coverage excepting the Arctic regions. List price is about $6,000 although the street price is now about half that. The Mini-M provides telephone communications as well as data at 2400 baud enabling access to the Internet for email although very slow by today's standards. The radome on these systems is the size of a basketball and some now have gyroscopically controlled antennas.

Although the initial cost has come down, Inmarsat C and the Mini-M are expensive in terms of operational costs. As a consequence, they are normally found on only the largest cruising yachts. A Mini-M was installed on Geronimo, the CommVes for the Newport Bermuda Race 2000 and 2002. It was found to be satisfactory although the antenna had difficulty keeping up with the boat's motion.

The other two widely used services employ hand held devices. They are Iridium with worldwide service including artic regions, and Globalstar with extensive coverage in North and South America, Europe, Asia, Australia and New Zealand. Because of their lowered costs and ease of installation, they are starting to be found on offshore yachts. A Globalstar on loan from West Marine was onboard Geronimo for backup on the 2002 Race. Its performance and ease of use was thought to be superior to the Mini-M.

Unfortunately for the ocean going yacht, there are major voids with Globalstar's coverage in the southern hemisphere, particularly in the south Atlantic, Indian and south Pacific Oceans. Globalstar uses a system concept called "bent pipe" that effectively reflects a message from a yacht at sea to a shore station. This means that the yacht must be close enough to shore for the satellite to see both it and the shore station at the same time.
As a rule of thumb, Globalstar works within about 200 miles of the shore and in that area, it works very well. Many of the yachts in the Newport Bermuda Race 2002 had Globalstar phones and were pleased with their performance even though Bermuda is some 600 miles off the coast. Globalstar can provide a map showing the areas of coverage.

Iridium satellites on the other hand can pass traffic from satellite to satellite until one of them is within sight of a ground station. This "relay" system concept provides true worldwide coverage although the added capability comes at an additional cost.

Both Iridium and Globalstar have had financial difficulties. Iridium was saved at the last moment from shutting down it's satellites by the US Government when it was realized that the military is heavily dependant upon the system. Globalstar filed under Chapter 11 and has been working on developing a recovery plan. With these financial

difficulties, it is anyone's guess about what will happen when the satellite orbits decay and they are no longer operational. In the meantime, they are available to anyone willing to subscribe to their services.

Iridium's data transmission rate is 2400 baud. Compression routines are available to speed it up to about 10,000 baud. Globalstar's transmission rate is 9600 baud and is less expensive per minute although roaming charges apply. Users of both systems consider Globalstar's voice quality to be superior.

2.1 Some Price Comparisons

A new Iridium with all the whistles lists for about $3,000 although rebuilt bare units have been available for about $600. A Globalstar package was offered at the 2003 Atlantic City Boat Show for US$ 649. It should be kept in mind that the first costs of these units are the lesser of the charges.

A vendor at the Atlantic City Boat Show 2003 offered the following pricing packages:

	Iridium	**Global Star***
Activation Fee	49.95	50.00
Airtime per minute	1.50	0.99
Airtime: Iridium to Iridium	0.99	
Airtime: Iridium to Inmarsat	10.00	
Monthly Fee	20.00	34.95**
SIM - 200 minutes	300.00	
* Other Plans Available		
** Timeline 30 includes 30 minutes voice or data		

The following matrix was provided courtesy of Dan Piltch of Marine Computer Systems in Portland, Maine. It compares the features of four systems which are the most popular satellite systems on the market in 2003:

	Inmarsat Mini M	Inmarsat C	Iridium	Globalstar
Voice	Y	N	Y	Y
Email	Y	Y	Y	Y
Internet & Attachments	Y	N	Y	Y
Fax Capable	Y	N	N	N
Automatic Weather & Safety	N	Y	N	N
Receive Weather Fax Charts	Y	N	Y	Y
GMDSS / Distress	N	Y	N	N
Initial Cost	$4,500	$3,200	1495 Handheld $2,700 Fixed	$495 Handheld $2,700 Fixed
Monthly Fees	N/A	N/A	$240 / Year	$420 / Year
Transmission Costs	$2.50 / min (Outgoing Only)	$0.008 / byte (Compression Improves Throughput)	$1.50 / min @ 2400 bps	$.99 / min @ 9600 bps Roaming Charges Outside US, Canada And Much Of Caribbean
Coverage	Spot Beam Mostly 70 N to 70 S	70 N to 70 S	Global	200 nm + Offshore (See Map)

Note that Globalstar has roaming charges in addition to the regular charges.

Additional information, short term rental and promotional pricing are available from both Globalstar and Iridium. See www.globalstar.com and www.iridium.com on the web for further details.

2.2 A Comparison Between Satellite and SSB

Satellite systems and the ubiquitous SSB both have advantages and disadvantages when compared to each other. From a cost perspective, satellite systems are expensive to buy although some factory refurbished units have been on the market in the $500 - $600 range. As noted above, they are, very expensive to use. If the First Mate wants to gab with the grandchildren using one of these units, the costs will become dramatic.

Satellite systems are occasionally subject to atmospheric interference, have blank zones depending upon the product and an inability to contact someone when help is needed or for that matter, anyone else at sea without a phone or known phone number. On the other hand, calls can be made to/from anywhere in the world (Iridium) to summon help. For example, a call could be made to the USCG from somewhere in the Southern Atlantic who could then alert and possibly divert the closest commercial or naval vessel to your emergency.

SSBs have some of the same shortcomings as well. The range can be limited by atmospheric conditions, the weather, the frequency and the power available to the transceiver (on the boat) at the time of transmission. Until recently, SSB has been less expensive to purchase in comparison to satellite systems although the price of satellite systems have been coming down as noted. The big consideration however is that SSB normally costs nothing to use unless a shore side station is being used for services such as a phone patch or email.

Weather broadcasts and forecasts are extremely important when offshore and is a primary consideration in having SSB or for that matter, SSB and a satellite system. Synoptic weather charts similar to Weather Facsimiles (WX Fax) can be downloaded from the internet at any time upon demand with a satellite system. They are crisp and of the same high quality one would expect at home using a phone line. Depending upon electrical noise on board, the transmitter power, atmospheric conditions and range, a WX Fax of the same quality can be received on the SSB although typically, the quality is somewhat less. The SSB has the advantage of accessing many weather stations around the world with localized analysis whereas satellite weather requires knowing the internet website.

Note: A list of the Volvo Round The World Race 2001 WX websites is included in the Appendix.

At this time and aside from VHF, the SSB is the most common form of communication with and between cruisers offshore. There are many active nets around the world meeting on a daily basis passing on news and information of interest to cruisers. In conjunction with an onboard computer, the SSB can receive weather facsimiles, Navtex broadcasts including Notices to Mariners, RTTY weather information, voice weather broadcasts and can communicate with airplanes and most government coastal authorities overseas. Many coastal countries routinely broadcast local weather in English as well as the local language on Medium Frequencies (MF). The list goes on.

In recognition of their continued widespread usage, the primary focus of this memorandum deals with The Single Side Band radio. Where money is no concern, the ideal communication station would have both SSB and Satellite capability. In either case, a computer (usually a laptop) is required to utilize many of the available services.

3 SSB Radio Assistance and Emergencies

3.1 USCG Communication Stations

The USCG maintains stations at Chesapeake, VA and Pt. Reyes, CA called Master Stations. They are the primary communication sites for continental US. The other stations in the following table link into them for their respective remote areas. Exceptions for this are Guam (partially remote to Hawaii) and Kodiak, AK which is independent.

Station		Location	
NMN		Chesapeake, VA (Norfolk)	Master
NMF		Boston, MA (Marshfield)	Remote
NMA		Miami, FL	Remote
NMG		New Orleans, LA (Belle Chase)	Remote
NMC		Pt. Reyes, CA (San Francisco)	Master
NMO		Honolulu, HI	Remote
NRV		Guam	Partial Remote
NOJ		Kodiak, AK	Independent

3.2 USCG Distress and Safety Watch Keeping Schedule

The USCG maintains a 24 hour watch on 2182 kHz at all small shore stations. Due to range limitations on this low frequency however, a yacht more than about 150 miles offshore may be able to hear them on 2182 or 2670 kHz (their working channel) but not reach them when transmitting.

Recognizing this limitation which changes with the daylight hours, the USCG uses the following simplex and duplex frequencies for their hailing and working channels. If you are unable to reach them in an emergency, check to be sure you are calling them on a frequency they are currently watching.

If you are more than 150 miles off shore, your best bet is to call them on one of the duplex frequencies below. While Ham radios do not have direct duplex capability, almost all have a similar function called “split” that a knowledgeable user could set up to operate in the same manner. Note that Ham radios are not FCC “Type Accepted” for marine duplex channels.

USCG Safety and Watch Keeping Frequencies and Schedule:

ITU	Yacht TX	Yacht RX	NMN	NMF	NMG	NMA	NMC	NMO	NOJ	NRV	
	2182	2182						24 Hrs			Note 1
	2670	2670									Note 2
	4125	4125	---	---	---	---	---	---	24 Hrs	---	
424	4134	4426	2300 - 1100	2230 - 1030	24 Hrs	---	24 Hrs	0600 - 1800	On Request	---	Note 3
601	6200	6501	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	0900 - 2100	Note 4
816	8240	8764	24 Hrs	24 Hrs	24 Hrs	---	24 Hrs	24 Hrs	On Request	---	Note 4
1205	12242	13089	1100 - 2300	1030 - 2230	24 Hrs	24 Hrs	24 Hrs	1800 - 0600	On Request	2100 - 0900	Note 5
1625	16432	17314	On Request	On Request	On Request	24 Hrs	On Request	On Request	On Request	---	Note 6

Note 1: With the short range inherent with 2 MHz frequencies, the USCG monitors 2182 kHz at local stations rather than remotely at Master Stations Chesapeake and Pt. Reyes.

Note 1: Although 2182 will work in AM mode, USB is recommended, preferred and also stipulated by the US FCC. It also works better – much better. If you want to be heard, make sure the mode is USB.

Note 2: 2670 kHz is the USCG Working Frequency used for search, navigational and weather warnings and weather broadcasts

Note 3: Watched in the NW Atlantic and Honolulu during night hours only.

Note 4: Watched continuously by Master and Group Stations.

Note 5: Watched in the NW Atlantic and Honolulu during Daylight hours only.

Note 6: Watched continuously by Miami. All other frequencies are by request.

3.3 USCG Phone Numbers

3.3.1 Atlantic:

The USCG information telephone number is 703 – 313 – 5400.

The Atlantic Area Command Center (CAMSLANT) is located at Portsmouth, VA. Distress calls are handled there or forwarded to the appropriate USCG Rescue Coordination Unit. Their 24-hour phone number is 757 – 398 – 6231.

CAMSLANT: 800 – 742 – 8519 & 757 – 421 – 6240

For additional information, the email address is: commandcenter@lantd5.uscg.mil.

3.3.2 Pacific:

The Pacific Area Command Center (CAMSPAC) is located at Pt. Reyes, California, just north of San Francisco. As with the Atlantic Area Command Center, distress calls are handled there or forwarded to the appropriate USCG Rescue Coordination Unit. Their 24-hour phone numbers are:

CAMSPAC: 877 – 662 – 4636
OPPS Chief: 415 – 669 – 2047

3.4 International Distress, Safety and Hailing Frequencies

Most of the authorized SSB bands have a designated frequency for hailing and safety purposes. With all other conditions normal, the range of a transmission is a function of the frequency (see paragraph 11.4 below) and the time of day. Many countries and some ships at sea will monitor these frequencies in addition to the International Distress frequency of 2182 kHz.

Note that 2182 kHz also serves as a hailing frequency for the 2 MHz band. These frequencies are <u>all</u> simplex (transmit and receive on the same frequency), Upper Sideband and with the exception of 2182 kHz, are **<u>not</u>** the same as those used by the USCG.

ITU	Freq	Mode
	2182	Simplex
450	4125	Simplex
650	6215	Simplex
850	8291	Simplex
1250	12290	Simplex
1650	16420	Simplex

3.5 Bermuda Rescue Coordination Centre (BRCC) and Bermuda Harbour Radio

The Bermuda Rescue Coordination Centre and Bermuda Harbour Radio (call sign ZBM) are co-located. A 24-hour watch is maintained on the frequencies listed below, and the facility is in 24-hour contact with Coast Guards and other air-sea rescue centers in North America, Europe and the Caribbean. From personal observation, it is a first rate operation.

Bermuda Harbour Radio broadcasts Marine Safety Information on a 24-hour schedule (see below).

A VHF public repeater for CH 07 International is located on top of Gibbs Hill providing extended VHF range. It is used for weather broadcasts as well as extended range ship-to-ship VHF transmissions due to the altitude of the antenna.

Note that US VHF CH 07 is actually CH 07A which is simplex and won't work for this service; the yacht's VHF must be switched to "International" (duplex) for this "on demand" service to function properly.

3.5.1 Bermuda Rescue Coordination Centre frequencies

With the exception of 2182 kHz, these frequencies (on the next page) differ from those of the USCG. In addition, 2182 and 4125 kHz are the only simplex frequencies.

Yachts planning a passage to Bermuda should ensure the following frequencies are readily available on their radio, particularly 2582 / 2049 kHz.

	ITU	Yacht Rx	Yacht Tx	Mode
Hailing & Emergency		2182	2182	Simplex
Hailing & Safety	450	4125	4125	Simplex
Working Frequencies		2582	2049	Duplex
Working Frequencies	410	4384	4092	Duplex
Working Frequencies	603	6507	6206	Duplex
Working Frequencies	817	8767	8243	Duplex
Working Frequencies	1220	13134	12287	Duplex
Working Frequencies	1618	17293	16411	Duplex
VHF Channels		16, 27 & 68		

3.5.2 Additional BRCC Contacts

INMARSAT C AOR (E): 581 431010110 Answerback RCCB X
INMARSAT C AOR (W): 584 431 010120 Answerback RCCB X

Tel: (441) 297 – 1010 Fax: (441) 297 - 1530 Website: www.rccbermuda.bm
Email: operations@rccbermuda.bm

The station is also A1 and A2 compliant in accordance with the Global Maritime Distress and Safety System. Digital Selective Calling is therefore also possible by yachts fitted with DSC equipment on VHF Channel 70 and on MF 2187.5 kHz using Bermuda Harbour Radio's MMSI Number: 003100001

3.6 Global Marine Distress and Safety System - GMDSS And DSC

GMDSS, sometimes called Digital Selective Calling (DSC) is an automatic system using both GPS and VHF or SSB radio for distress situations. Using the location determined by a GPS, the system can send distress messages and automatically receive distress information and warnings that could prevent a distress situation. It has been implemented by most merchant vessels on the high seas with the exception of some US flagged vessels in domestic waters. The USCG plans to phase in their system called Rescue 21 with full implementation by 2006.

With GMDSS, a vessel can initiate a distress signal by activating a switch or button on the VHF or SSB. An automated call is then broadcast on the DSC frequency and other receivers within range pickup the signal

automatically. The GMDSS signals include GPS coordinates. Voice response is made on the frequencies listed in the following table which are the same safety frequencies previously noted and are simplex so everyone can listen.

DSC		ITU		Voice
VHF 70				
2187.5		0		2182.0
4207.5		450		4125.0
6312.0		650		6215.0
8414.5		850		8291.0
12577.0		1250		12290.0
16804.5		1650		16420.0

Every ship at sea is required to maintain a continuous DSC watch as appropriate to the sea area in which the ship is sailing**. Watchkeeping shall be on 8414.5 kHz and one other HF frequency selected according to the time of day, the season of the year and the distance from appropriate coast stations.**

3.6.1 DSC Implementation in the USA

DSC implementation is in a transition period. On February 1, 1999, most merchant vessels with DSC equipped radios world wide were allowed to stop watching 2182 kHz although VHF 16 is still required. Because of problems with interoperability, the FCC delayed implementation in the US although they require all marine radios sold in the US to have a DSC capability. This doesn't mean that your new radio has DSC but rather that it can be added if not already part of the unit.

For DSC, two areas around the US have been defined. They are Sea Area A1 (VHF) and Sea Area A2 (MF/HF or SSB). The USCG program for VHF is called "Rescue 21" and is scheduled to be operational by 2006. Until this system is installed, the USCG cannot reliably receive DSC distress calls on VHF.

As for SSB (MF/HF), the CG is operating DSC offshore in Sea Area A2 on a trial basis. Signals received at Boston, Miami and New Orleans are sent to Camslant, Chesapeake and similarly, Honolulu into Pt Reyes. Kodiak is not remoted. All these locations are DSC equipped shore stations for MF/HF. Although scheduled to be operational after October 1, 2002, the US has not yet declared the system operational.

Trial operations have revealed two major problems with DSC operations. The first is the failure of vessels to interconnect the GPS to the DSC equipped radio. Without the GPS position, the CG can't know where to look. Secondly and most significant is the failure to follow up the DSC alarm with voice communications on one of the safety frequencies noted above. Note: These frequencies are the standard SSB safety frequencies and are **not** the same as the DSC frequencies.

3.6.2 DSC Testing

The DSC channels have become quite congested with test calls. By the summer of 2003, the volume had risen to the point where the ITU became concerned with test calls interfering with distress and safety calls. They recommended to the IMO (International Maritime Organization) and the IMO has agreed that test calls be limited to once per week.

3.7 SSB Emergency Card

All cruising yachts on the high seas should have an emergency card posted near the SSB / Ham radio to enable persons not familiar with the radio's operation to use it in an emergency. This also applies to crew members who know radio but are not familiar to the particular installed model. The prudent offshore skipper will ensure everyone in the crew has a chance to become familiar with the SSB and the Emergency Card before casting off.

Emergency Cards for three Icom SSBs are available at this CCA website (www.cruisingclub.org) under the sidebar Offshore Communications and Electronics. The radios are the Icom M-700PRO, M-710 and M-710RT. The actual card is the last two pages of these papers which can be printed and laminated back to back. These cards can also be used as a model for radios other than those listed.

It is important for the first several programmable channels on a SSB to include the international safety channels and that 2182 kHz has been set to USB. The Emergency Card papers describe this in some detail.

4 Voice Weather

Many countries broadcast weather information. In the US, the National Weather Service supplies the information broadcast by the USCG to the high seas. The broadcasts include Synthesized Voice Weather (Perfect Paul who sounds like Darth Vader), excellent weather facsimiles (WX Fax), satellite pictures, Navtex and more.

These WX broadcasts are receive only, meaning that a quality "short wave" receiver with good sensitivity and digital tuning connected to a computer will do the job as well. This enables the yacht owner to practice at home receiving these broadcasts prior to casting off and is highly recommended.

4.1 US Coast Guard Voice Weather Broadcasts

	UTC					
NMN	**- CHEASAPEAKE**					
	0330	4426	6501	8764		
	0500	4426	6501	8764		
	0930	4426	6501	8764		
	1130		6501	8764	13089	
	1600		6501	8764	13089	
	1730			8764	13089	17314
	2200		6501	8764	13089	
	2330		6501	8764	13089	
NMG	**- NEW ORLEANS**					
	0330	4316		8502	12788	
	0500	4316		8502	12788	
	0930	4316		8502	12788	
	1130	4316		8502	12788	
	1600	4316		8502	12788	
	1730	4316		8502	12788	
	2200	4316		8502	12788	
	2330	4316		8502	12788	
NMC	**- PT. REYES**					
	0430	4426		8764	13089	
	1030	4426		8764	13089	
	1630			8764	13089	17314
	2230			8764	13089	17314

NMO	**- HONOLULU**					
	0600		6501	8764		
	1200		6501	8764		
	1800			8764	13089	
	0000			8764	13089	
NOJ	**-KODIAK**					
	0203		6501			
	1645		6501			
NVR	**- GUAM**					
	0330		6501		13089	
	0930		6501			
	1530		6501			
	2130		6501		13089	

These voice broadcasts are synthesized and sometimes difficult to understand without familiarity. The sequence of information is consistent from day to day. It is strongly recommended that a small cassette recorder be used to retain the broadcast information.

4.2 US Coast Guard Wind Strength Designations

Wind strength descriptions in these broadcasts differ from those used in VHF coastal forecasts. The two categories follow:

	Coastal		**Offshore**
Small Craft Advisory	18 - 33		
Gale Warning	34 - 47		
Storm Warning	> 48		
Tropical Storm Warning	34 - 63		
Hurricane Warning	> 64		
		Light	< 20
		Moderate	21 - 33
		Gale	34 - 47
		Storm	> 48

Wind Speed In Knots

4.3 Bermuda Harbour Radio – Marine Safety Information Broadcasts

Bermuda Harbour Radio broadcasts marine safety information simultaneously on 2582 kHz (good for 150 – 250 miles) and VHF Channel 27 (good for 60 miles).

Note: Local navigational warnings and the Bermuda Weather Forecast are broadcast at 0900 Local Time on Channel 07 International. All broadcasts are announced on 2182 kHz and VHF Channel 16 before shifting to the working frequencies of 2582 kHz and VHF Channel 27.

Time UTC	Announcement Frequency	Working Frequency	Content
0035	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings and Bermuda Weather Forecast
0435	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings and Bermuda Weather Forecast
0835	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings and Bermuda Weather Forecast
1235	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings, USNWS Offshore Forecast and Bermuda Weather Forecast
1635	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings and Bermuda Weather Forecast
2035	2,182 kHz / Channel 16	2,582 kHz / Channel 27	Notices to Mariners, Local Nav Warnings, USNWS High Seas Forecast and Bermuda Weather Forecast

4.4 Canadian Voice Weather Broadcasts

Station CFH, Radio Halifax is a 10 kW station which can be heard over much of the North Atlantic. In the traditional manner, it broadcasts on several frequencies at designated times. USCG broadcasts for Offshore and the High Seas supplement the CFH broadcasts on the East Coast. In addition, there are two low frequency SSB stations with voice weather on both the east and west Canadian coasts. These stations broadcast at different times using common frequencies, one frequency for all the stations on the East coast and one for the West. Because of the low frequency (2 Megs), the range is limited.

There is an extensive network of VHF stations broadcasting around the Canadian coasts. A listing of these has been compiled by William Hepburn at website www.iprimus.ca/~hepburnw. He has also posted many other articles of interest to mariners.

4.4.1 Canadian SSB Voice Weather Stations

The following table is a partial listing of the many Canadian stations broadcasting weather on both VHF and SSB. Note that stations broadcasting in the 2,000 kHz frequencies are fairly short range.

Station / Location	Call Sign	Freq kHz	Time - UTC ---------->					
Tofino, Vancouver Is.	XLK 835	2054.0	1250	1850	0050	0650		
Prince Rupert, BC	VOH 498	2054.0	1305	1905	0105	0705		
	VGL 24	2054.0	1305	1905	0105	0705		
Sydney, Nova Scotia	VCO	2749.0	0740	1440	1510	2110	2140	0040
Halifax, Nova Scotia	VCS 2	2749.0	0810	1310.0	1540.0	1910	2010	0110
Halifax, Nova Scotia	CFH	4255.0	1300	1630	0100	0430		
	CFH	6430.0	1300	1630	0100	0430		
	CFH	8697.0	1300	1630	0100	0430		
	CFH	12726.0	1300	1630	0100	0430		
	CFH	16926.5	1300	1630	0100	0430		

4.5 Radio WLO Voice Broadcasts

Radio WLO, a commercial radio station has been providing High Seas Ship To Shore service in the south west North Atlantic, Caribbean and Gulf of Mexico. Traffic lists of calls waiting are broadcast every hour.

Starting August 2003, WLO Radio, operating as ShipCom also began HF radiotelephone service through radio station KLB located in Seattle, WA. for Pacific and Alaska waters.

The synthesized Voice Weather and traffic lists broadcast schedule has been revised. In January 2004, it was:

WLO Mobile			
Area	Times		
Gulf Of Mexico	1300	1600	2200
SW North Atlantic	1300	1700	2200
Caribbean Basin	1300	1800	2200

KLB Seattle broadcasts weather and traffic for the Pacific and Alaskan fishing grounds at the top of the hour 24/7. For more information, see their website at: www.wloradio.com and Chapter 7.1 on Page 31.

Note: Yachts intending to use this “for profit” service are cautioned to make payment arrangements by telephone prior to casting off. The alternative will require broadcasting a credit card number on high frequency which could result in billings for some unrecognized calls to distant places.

In a recent change, WLO will now place collect calls.

4.6 South Bound II - Herb Hilgenberg

Herb Hilgenberg is an accomplished amateur weather analyst and forecaster located near Toronto, Canada. He is a recognized and acclaimed expert on the weather in the North Atlantic who maintains a seven day per week SSB weather net for yachts sailing throughout the North Atlantic and Caribbean. Herb has been recognized by the CCA, the US Coast Guard and other organizations for his contributions to safe sailing.

Herb’s service is free to any yacht logging in during the “Check-In” period. This can be a difficult task because of the volume of yachts checking in during the migration seasons. Check- in consists of giving the boat name, location and destination. From a practical standpoint, it may take a day or two of checking-in to be recognized because of the traffic volume.

Herb will call back to each individual yacht with a tailored weather forecast. To start off, he will ask each yacht for their position to the nearest tenth of a degree, the barometer reading in millibars, the sea state and the cloud cover.

Yachts unable to check in can monitor forecasts for yachts in their area or even request a relay. This is also a good way to learn of other yachts in the area in the event assistance is needed.
Herb progresses from region to region, moving with the propagation He normally starts with the NW Atlantic in the area of Cape Cod to Cape May where propagation tends to drop out shortly after 2000Z. When copy is poor, he temporarily shifts to 8294.0 kHz at around 2100Z in June and July if he knows traffic is attempting to log in or monitor in that area. He ends several hours later with Trans-Atlantic traffic, usually in the area beyond the Azores.

The South Bound II net schedule is:

Net Schedule:	ITU	Freq	Time
	1253	12359.0	
Check-In:			1930
Net Start:			2000

Herb’s primary website is: http://www3.sympatico.ca/hehilgen/vax498.htm

His email address is: hehilgen@sympatico.ca

5 Weather Fax And RTTY Broadcasts

In addition to Voice Weather, the USCG broadcasts Offshore and High Seas Weather Facsimile (WX Fax) analysis and forecasts provided by the National Weather Service. Three of these stations are in continental US, located near Boston, MA (Marshfield), New Orleans, LA (Belle Chase) and San Francisco, CA (Pt. Reyes). Other USCG stations are located at Honolulu and Kodiak, AL and are included in the table below along with CFH Radio at Halifax, Canada. For the eastbound yacht on the high seas, the table also includes Northwood, UK and Offenbach, Germany.

Other stations, frequencies and schedule are listed in Tim Rulon's Worldwide Marine Radio Facsimile Broadcasts noted below. The Appendix contains detailed schedules for US, Canadian, UK and German WX Fax broadcasts current in September 2003. Surprisingly, these schedules change and the current schedule should be received by SSB from those stations broadcasting their schedule

The weather facsimiles broadcasts from NMF can usually be received on the west coast of Europe and well into the Mediterranean (as far as Greece) during good conditions in early morning.

5.1 Selected Weather Fax Stations

Carrier frequencies are normally published for weather fax broadcasts which must be adjusted down 1.9 kHz for proper reception on the SSB receiver. The frequencies in the following table **HAVE BEEN ADJUSTED**, meaning they are the frequencies to tune the SSB when using a computer connected to the SSB to receive the WX Fax. Dedicated WX Receivers may have to be adjusted back UP to the carrier frequency since their design includes the adjustment.

Most broadcasts offer a wide variety of product and the schedule should be consulted. The surface analysis is often repeated near the end of the broadcast.

Reception from Northwood sometimes seems to be enhanced with an adjustment of only 1.7 or 1.8 kHz and their broadcasts tend to start around the listed time rather than on the exact scheduled time. Although this is the Royal Navy, one gets the impression they would rather not be doing these broadcasts. Unfortunately, their schedule does not seem to be available from official sources on the web; the detailed schedule in the Appendix was received via SSB. The difficulty of receiving the schedule at 0236 or 1436 UTC cannot be overstated.

Station	Call Sign	Adjusted Freq.	Start Times						Schedule UTC
Boston, MA	NMF	4233.1	0230	0745					0243 / 0254
Boston, MA	NMF	6338.6	0230	0745	1400	1900			0243 / 0254 & 1405 / 1420
Boston, MA	NMF	9108.1	0230	0745	1400	1900			0243 / 0254 & 1405 / 1420
Boston, MA	NMF	12748.1	--	--	1400	1900			1405 / 1420
New Orleans, LA	NMG	4316	0000	0600					0825
New Orleans, LA	NMG	8502	0000	0600	1200	1800			0825 & 2025
New Orleans, LA	NMG	12788	0000	0600	1200	1800			0825 & 2025
New Orleans, LA	NMG	17144.5			1200	1800			2025
Pt. Reyes, CA	NMC	4344.1	0230	--	--	--	1930	2300	2324 / 2335
Pt. Reyes, CA	NMC	8680.1	0230	0750	1100	1430	1930	2300	1104 / 1115 & 2324 / 2335
Pt. Reyes, CA	NMC	12728.1	0230	0750	1100	1430	1930	2300	1104 / 1115 & 2324 / 2335
Pt. Reyes, CA	NMC	17149.3	0230	0750	1100	1430	1930	2300	1104 / 1115 & 2324 / 2335
Pt. Reyes, CA	NMC	22525.1	--	0750	1100	1430	1930	--	1104 / 1115

Honolulu, HI	KVM70	9880.6	2350	0530	--	1733			2018
Honolulu, HI	KVM70	11088.1	--	0530	1150	1733			1045 & 2018
Honolulu, HI	KVM70	16133.1	2350	0530	--	1733			2018
Honolulu, HI	KVM70	23329.6	--	0530	1150	1733			1045
Kodiak, AL	NOJ	2052.1	--	1000	1600	--			
Kodiak, AL	NOJ	4296.1	0400	1000	1600	2200			
Kodiak, AL	NOJ	8457.1	0400	1000	1600	2200			
Kodiak, AL	NOJ	12410.6	0400	--	--	2200			
Halifax, Can	CFH	4269.1	Mostly one minute after the hour						1101
Halifax, Can	CFH	6494.5	Mostly one minute after the hour						1101
Halifax, Can	CFH	10534.1	Mostly one minute after the hour						1101
Halifax, Can	CFH	13508.1	Mostly one minute after the hour						1101
Northwood, UK	GYA	2616.6	Mostly Hourly						0236 & 1436
Northwood, UK	GYA	4608.1	Mostly Hourly						0236 & 1436
Northwood, UK	GYA	8038.1	Mostly Hourly						0236 & 1436
Northwood, UK	GYA	11084.6	Mostly Hourly						0236 & 1436
Hamburg, Gm	DDH3	3853.1	--	0930	1520	1800	2100		1111
Hamburg, Gm	DDK3	7878.1	0430	0930	1520	1800	2100		1111
Hamburg, Gm	DDK6	13880.6	0430	0930	1520	1800	2100		1111

5.2 Weather Fax Programs

Dedicated weather fax units are still available on the market although now giving way to the ubiquitous cruiser's laptop computer which can be used for many other applications. Dedicated receivers have the advantage of being available when the lap top becomes ill which happens more often than advertised. This doesn't mean that these stand alone units don't also have problems, but they are independent and eliminate putting all the eggs in one basket.

Most cruisers use a laptop for a variety of tasks including receiving weather fax broadcasts. There are several acclaimed programs on the market to do this and they seem to work well. A listing of many of these programs along with other information may be found at the National Weather Services' website:
http://nws.noaa.gov/om/marine/radiofax.htm

There are many programs available on the internet which generally work well and are available at reduced cost. One of them is JVComm32 which was written and is maintained by Eberhard Backeshoff, a brilliant amateur radio enthusiast in Germany. The program as with others has several good and a few not so good features. It works well and has more features than the average yachtsman will ever need or even think about. It is relatively inexpensive because it uses the sound card already available in most modern laptops rather than a separate modem or PCMCIA card. It can be downloaded from the internet at www.jvcomm.de (click on English) making it available anywhere if your computer crashes (which happens). It is available in several languages

On the not so good side, some of the explanations in JVComm32 are difficult to follow, some of the operating steps are awkward and weather fax broadcasts of satellite pictures are not readily available in color. The lack of color may not sound like a problem until you are on the lookout for atmospheric precipitation during hurricane season.

Overall, this program works well and is the choice of many cruisers.

An alternative to receiving WX Fax would be to use a Pactor modem that can be set up to automatically tune the SSB to predetermined frequencies and schedule. This is discussed further in chapter 8.3, SailMail.

5.3 Weather Information On The Web

The web contains many sources and information about weather and weather facsimile broadcasts. In addition to the CCA Website at www.cruisingclub.org/, a few others are:

The NWS Marine & Costal Service Publications:

www.nws.noaa.gov/om/marine/pub.htm

Notice: The Marine Prediction Center name has been changed to the Ocean Prediction Center as of Sunday, January 12th, 2004. The new name supposedly will better reflect the emerging role of ocean activities within NCEP, the National Weather Service, and NOAA.

The URL address changed on January 29th to http://www.opc.ncep.noaa.gov. The old URL address, www.mpc.ncep.noaa.gov no longer works.

www.opc.ncep.noaa.gov

Ocean Prediction Center's Radio Facsimile Charts User's Guide on the web:

www.opc.ncep.noaa.gov

- An explanation of the radiofax charts

Ocean Prediction Center's Weather charts:

www.opc.ncep.noaa.gov/shtml/A_HighSeas.shtml

www.opc.ncep.noaa.gov/shtml/P_HighSeas.shtml

- Surface Analysis, 500 mb analysis, Wind Wave reports and forecasts for both the entire North Atlantic and North Pacific to East Asia in chart form. These are essentially the same as those broadcast as radiofax by the USCG. A is for the Atlantic and P for the Pacific. There is a "low" dash between the A (or P) and HighSeas (A_HighSeas) which doesn't show in these illustrations. These addresses are case sensitive.

- For surface analysis in black & white, click on B/W GIF. For analysis in color, click on GIF. To print out the chart on an 8 ½" x 11" or A4 page, click on TIF. You must have a TIF viewer such as Photo Shop to do this.

Marine weather facsimile:

http://weather.noaa.gov/fax/marine.shtml

- The summary and shortcut to the National Weather Service's Marine Products available via radiofax Worldwide Marine Radio Facsimile Broadcasts:

www.nws.noaa.gov/om/marine/rfax.pdf

- This definitive work was prepared and maintained by Tim Rulon of the National Weather Service. At the time of this draft, the most recent version was dated 4 Sep 2003. This comprehensive work lists stations by geographic area, carrier frequencies, transmission power and complete schedules. If you can't find a station here, it probably doesn't exist.

- It is recommended that all international bound offshore cruisers wishing to receive WX Fax via SSB download this file (in Acrobat's Adobe Reader) before casting off. Don't even think about printing it out unless you have paper to spare.

  NOTE: The frequencies listed in this great work differ from many of those in this paper. These listed frequencies are the carrier frequencies and must be adjusted 1.9 kHz down to receive on your computer using a SSB in USB mode.

Marine Product Dissemination Information - NWS:

www.nws.noaa.gov/om/marine/home.htm

- National Weather Service listing general information and links to other sites regarding WX Fax. Included are the broadcast times and frequencies for the USCG's Stations.

HF-Fax List complied by Marius Rensen in Hanover, Germany:

www.hffax.de

National Data Buoy Center:

www.ndbc.noaa.gov

- Weather buoys in regions along the US and Canadian West Coast from Alaska to the Mexican border including Hawaii, along the East Coast from Newfoundland to the Caribbean and the European West Coast from Southern Norway to Northern Spain can be accessed by clicking on the desired region and graphically selecting a buoy. Weather information available at the location selected includes wind direction and strength, wave height, air and sea temperature, atmospheric pressure and the like along with the recent history.

Canadian weather may be found at:

http://weatheroffice.ec.gc.ca/canada_e.html

Note: There is a "low" dash between canada and e.html which doesn't show well in this illustration.

Internet Weather Sites For the Volvo Round The World Race

- Rules for the Volvo Round the World Ocean Race in 2001 allowed each yacht to access a maximum of 10 websites during the race and required them to be identified. Scuttlebutt published the list in September 2001.

  There were eight yachts and naturally, not all the sites selected were the same. I've included the list in the Appendix because it is what eight of these skilled navigators thought they would need as they sailed around the world. Unfortunately, they are not all in English, may not be current nor have I checked them out.

5.4 Weather Fax in Europe and the Mediterranean Basin

Typically, WX Fax charts via SSB suffice for the West European coast. They can be downloaded from Hamburg, Germany (good), Northwood, UK (broadcasts around the clock, but not so good) and the USCG's NMF Marshfield, MA which can with good conditions be received just prior to dawn as far east as Greece on their 6 and 9 Meg frequencies. See the Appendix for frequencies and schedules.

Hamburg broadcasts at least one fax chart covering the entire Atlantic from the Nova Scotia / Florida coasts east through the Med to Turkey. Northwood broadcasts a plethora of information including 500 mb analysis and forecasts along with a lot of other material of little interest to cruising yachts. Boston (Marshfield) broadcasts for Area 2 and 4 cover as far east as Lo 10° E, just past Corsica & Sardinia.

Unfortunately, none of these Fax broadcasts truly address the need for localized weather forecasts in the Mediterranean.

5.5 Radio Telephony and Teletype (RTTY) in Europe and the Mediterranean Basin

The Mediterranean Sea is a large body of water and the weather can often be different from any one specific area to the adjacent. Further, there always seems to be either too much or not enough wind, making the need for localized forecasts very important. While WX Fax is good, they do not provide sufficient detail for these areas. The same applies to the North Sea and the Baltic.

A word of caution for the Med; if you see a cigar shaped cloud on an otherwise nice day, get the sails down quick.

Five day forecasts for areas of interest to German shipping are broadcast daily from Offenbach, Germany on RTTY, USB. The areas are the Baltic, the North Sea and the Mediterranean Sea. A few other locations such as the Black Sea and the Bay of Biscay are included. Following a general synopsis, these broadcasts list the location name, the Latitude and Longitude, Sea Surface Temp in C° and forecasts for 00Z and 12Z for the next five days. The forecasts include the wind direction, wind velocity in Beaufort, max gusts in the past 12 hours and wave height in meters. They are of particular interest and value to cruisers in western European waters and the Mediterranean Basin because they are reasonably localized.

An example of these broadcasts for the English Channel (East) received on 20 May 03 follows:

ENGLISH-CH.-E (50.1N 1.2W) SST: 11 C

WE 21. 00Z:	W	5 / 6-7 2 M //
WE 21. 12Z:	SW	3 / 1 M //
TH 22. 00Z:	SW-W	5-6 / 6-7 1 M //
TH 22. 12Z:	SW-W	5-6 / 7 1.5 M //
FR 23. 00Z:	SW-W	5-6 / 7 1.5 M //
FR 23. 12Z:	SW-W	5-6 / 7 1.5 M //
SA 24. 00Z:	SW-W	6 / 7 2 M //
SA 24. 12Z:	SW-W	6 / 7 1.5 M //
SU 25. 00Z:	W	4-5 / 6-7 1.5 M //
SU 25. 12Z:	W-NW	5-6 / 6-7 1.5 M //

Explanation:

Location Name:	ENGLISH-CH.-E (English Channel East)
Latitude & Longitude:	(50.1N 1.2W)
Surface Sea Temperature:	SST: 11 C
Day:	WE 21.
Forecast Time:	00Z:
Wind Direction:	W
Beaufort Wind Speed:	5 /
Past 12 Hr Gusts:	6-7
Wave Height:	2 M //

Settings of the computer program to receive these can be tricky and may take some experimentation. Using JVComm32, the settings were:

Baudot	50/450 (RTTY Nav/Met transmissions on short wave)
Rev	OFF
AFC	ON (adjust SSB frequency for minimum deviation indicated in red)
Freq	Adjust SSB RX frequency for 1.36 kHz below transmission frequency

Tuning exactly to frequency is critical when receiving RTTY signals. Similar to the WX Fax frequency adjustment from the carrier frequency, RTTY requires an adjustment of 1.34 kHz down from the carrier.

Unfortunately, most SSB receivers tune in minimum increments of 0.1 kHz. This means that the closest one can tune with these receivers is 1.3 or 1.4 kHz which doesn't do it. However, this can be contained by software programs featuring an Automatic Frequency Control (AFC) with sufficient range to make up the difference. The "Clarity" knob on the SSB can also make fine adjustments, but this can be tricky.

Forecasts for many areas of interest to German shipping are available. The list is lengthy and involves two concurrent broadcasts called Program 1 and Program 2 to cover all the information sent in this format. The frequencies and times in the following table are for Program 1, some of which is in German, but mostly in English. Much of the information for Program 2 is in German and seems to be more focused on commercial shipping.

RTTY broadcast times and frequencies for Program 1 from Offenbach, Germany for the Mediterranean are:

Time		**Frequency (Adjusted 1.4 kHz)**		
0415		4581.6	7644.6	10099.4
1115		4581.6	7644.6	10099.4
1550		4581.6	7644.6	10099.4
1610		4581.6	7644.6	10099.4
2215		4581.6	7644.6	10099.4
2315		4581.6	7644.6	10099.4

A copy of the latest schedule received from Offenbach in 2003 but dated 03 April 2001 is included in the Appendix. Unfortunately, the schedule does not appear to be available on the web. Also included in the Appendix is the sequence of locations forecast and their coordinates.

Note that the coordinates for some locations are different from what one would expect. For example, the Tyrrhenian Sea at La 42.5˚, Lo 10.5˚ is about halfway between Corsica and Italy just south of Elba and north of the center of the Tyrrhenian Sea by perhaps 150 nm. Nevertheless, the locations are indicative; these broadcasts are excellent and are repeated by voice on the Mediterranean Cruiser's Daily SSB Net.

While these broadcasts are for five days, meteorologists generally agree that forecasts beyond three days are more of an educated guess that might be helpful but not deserving great reliance.

5.6 European Time Differences

Of particular interest to yachts headed to Spain from England or France and other points north is the Offenbach RTTY forecast for the English Channel (East and West) and a location about halfway across Biscay on a line from Brest to Cabo Finisterre. The RTTY forecast for English Channel appears at the end of the North Sea broadcast, about 0410Z. The Bay of Biscay comes up about 0435Z at the end of the Mediterranean Sea forecast.

While these may sound like uncivilized times, it gets light out early being so far north. Daylight Savings Time called Summer Time (ST) in the EU is one hour in England, two hours in France and Italy and three hours in Greece ahead of Greenwich Mean Time (GMT) or Universal Coordinated Time (UTC). Note that ST in Spain is two hours while only one hour in Portugal. It helps to have a clock or watch set to GMT at the nav station.

The time differences to the US can be significant and there is an overlap between the US Daylight Savings Time and the EU Summer Time. Summer Time begins and ends at 1 a.m. Universal Time (UTC or GMT). It starts on the last Sunday in **March** and ends the last Sunday in October. In the EU, all time zones change at the same moment as contrasted with the US.

US Daylight Savings time starts for most locations at 0200 hrs in each time zone on the first Sunday of April and ends at the same time on the last Sunday in October. In the US, each time zone switches at a different time.

6 NAVTEX

Navtex is an international text radio broadcast system providing information for mariners in coastal waters. Most developed countries with coastal access broadcast Navtex messages and commercial vessels worldwide are required to carry a receiver. These broadcasts include navigation warnings, weather forecasts, Notices To Mariners, military activities, Search & Rescue and the like. The broadcast range is mostly less than 200 miles allowing the information to be tailored to local needs although it is sometimes not as specific as the user would like.

Weather alerts, particularly in the Mediterranean are mostly conveyed by Navtex although Italy continuously broadcasts the weather forecast for their areas on VHF 68.

Navtex radio broadcasts are always in English and on occasion, followed with the local language as well. This makes them particularly valuable for the cruiser in international waters such as the Baltic or the Mediterranean Basin where voice weather in English can be difficult to obtain.

In recent times, Canadian and European stations have started broadcasting the same information in the local language on 490 kHz in addition to the required English broadcasts on 518 kHz. Accordingly, some dedicated Navtex receivers now have both frequencies available.

Some computer weather programs feature subroutines for Navtex. While this is a typical and easily contained computer application, personal experience finds this can be difficult to accomplish while underway at sea, mainly because of timing. As an alternative, small dedicated receivers for approximately US$ 300 - $400, widely available in Europe and also from at least one discount supplier in the US work very well and are a much more convenient arrangement. These units, with very low current drain are left on all the time and the messages received retained in memory for presentation via an LCD on demand. Alternately, some units print the message. Both approaches eliminate the need to be present for the broadcast, one of the biggest obstacles to doing this on a laptop.

Each Navtex station is identified by a letter and takes turns broadcasting information for their area on a common frequency, 518 kHz. In the United States, NAVTEX is broadcast from Coast Guard facilities near Boston, Portsmouth, Savannah, Miami, New Orleans, San Juan, Cambria CA, San Francisco, Astoria OR, Kodiak and Honolulu. The coverage is mostly continuous around the continental coasts of the US as well as Kodiak and Puerto Rico. However, if you miss the broadcast for a particular station, it may be many hours before that station's turn comes up again.

The Canadian Coast Guard provides coverage for the Great Lakes in addition to their coastal waters. The 300 mile range transmitters on the Great Lakes are located at Wiarton (44º 20'N, 81º 10'W) and Thunder Bay (48º25'N, 89º20'W). Bermuda Radio provides similar coverage for their area.

For more information, see website www.navcen.uscg.gov/marcomms/gmdss/navtex.htm

The Appendix contains tables of the broadcast schedule for continental US, Canada and Bermuda in addition to an extensive listing of Navtex stations in other countries. The web site for additional stations worldwide is:

www.navcen.uscg.gov/marcomms/gmdss/NAVTEX-8c2.pdf

Some WX Fax computer programs enable Navtex reception from a SSB if the radio can receive at that low frequency. When tuning for Navtex, the carrier frequency of 518 kHz must be adjusted 1.4 kHz down to 516.6 kHz, FSK for proper reception (USB works fine if FSK is not available on the SSB). With SSB tuning limitations, an AFC feature in the program may be very helpful.

Selection of stations and types of messages may not be adjustable with the computer program meaning everything broadcast will be received. With the great sensitivity of SSB transceivers, garbled Navtex messages from distant stations will be received as well as messages of no interest. These programs work, but not well. In practice, it is easiest to simply leave a dedicated Navtex receiver on since it will only pick up selected stations (within range) and selected messages.

6.1 Navtex Message Codes

Codes for Navtex messages are standard world wide:

A	Navigation Warnings
B	Gale Warnings
C	Ice Reports
D	SAR Info & Pirate Warnings
E	Weather Forecasts
F	Pilot Service Messages
G	Decca Messages
H	LORAN Messages
I	OMEGA Messages (discontinued)
J	GPS and GLONASS Status
K	Other Electronic Navaid
L	Navigational Warnings - Sub & Gunnery Activity
V	Amplify A Above
W	Environmental - US Only (Not Used)
X	Special Services - IMO
Y	Not Used
Z	No Message On Hand
NNNN	End Of Message

6.2 A Navtex WX Message

The following message was received from Coruna, Spain on 2 Jun 03 on a dedicated Navtex LCD receiver. Gran Sol, Pazzen, Irose, Yeu, etc. are Wx forecast areas illustrated in the Appendix.

DE5101 1824 UTC JUN 03 WEATHER BULLETIN NR/ ROUTINE WEATHER BULLETIN AT 011730 UTC 1. NO GALE WARNING 2. GENERAL SYNOPSIS AT 011200 UTC AND EVOLUTION LOW 989 54N 25W OF BRITISH ISLES MOVING TO NORTHEAST. HIGH 1028 30N 45W SOUTHWEST OF AZORES STATIONARY 3. FORECAST VALID UNTIL 022400 UTC GRAN SOL IN WEST, SOUTH AND SOUTHWEST 5 OR 6 DECREASING TO 3 OR 4. IN EAST SOUTHWEST 4 BACKING TO SOUTH. SLIGHT INCREASING ROUGH IN WEST AND SLIGHT IN EAST. MODERATE PAZZEN IN SOUTHWEST 4 INCREASINGTO SOUTH 7. SLIGHT INCREASING ROUGH. SHOWERS IROSE, YEU AND ROCHEBONNE SOUTHWEST 4 BACKING TO SOUTH LATER. SLIGHT, BUT MODERATE IN WEST ALTAIR WEST4 OR 5 VEERING TO NORTHWEST. MODERATE CHARCOT WEST TO SOUTWEST 4 OR 5 DECREASING TO WEST 3 OR 4. SLIGHT TO MODERATE. SHOWERS FINISTERRE WEST AND SOUTHWEST 4 INCREASING TO SOUTH 5 OR 6. SLIGHT TO MODERATE. SHOWERS CANTABRICO WEST 3 OR 4 BECOMING TO VARIABLE.. SLIGHT TO MODERATE. SCATTERED SHOWERS AZORES AND JOSEPHINE WEST AND NORTHWEST 4 OR 5. SLIGHT TO MODERATE IN NORTH PORTO AND SAO VICENTE NORTHWEST 3 OR 4. SLIGHT.

It can be seen that reading this takes some getting used to, but it gets easier with familiarity. Clearly, an awareness of the sea area designations is necessary for this to have value. See the Appendix for Sea Area Designation Charts.

7 Ship To Shore Communications and Email

Several commercial services are available enabling a yacht at sea to send and receive e-mail. These include Radio WLO, Globe Wireless, Sea Wave (formerly Pin Oak) and SailMail to name just a few. WLO also offers SSB Voice to telephone (phone patch) enabling a yacht to call someone on shore or visa versa. In addition to these commercial organizations, one of the Ham networks is also noted below.

To use these text services for email (not voice), a High Frequency (HF) modem is required to process the signal. They are conceptually similar to the modems used in a Personal Computer to connect to a telephone line. The HF modem is required to process the SSB radio signals (modulation) and act as an interface to the computer. Check with the service you wish to use for their equipment recommendations which can vary.

Caution: Since these communications are via radio, anyone with the same equipment can receive your message (known as “reading the mail”) unless encryption equipment is used.

7.1 WLO - Mobile Marine Radio, Mobile, AL

Radio WLO is a commercial radio service available for making calls throughout the world via landline telephones similar to that previously offered by the AT&T High Seas Operator. They will accept data in various forms making e-mail possible from a yacht with the required equipment (PACTOR, PACTOR II, PACTOR III and SITOR).

Yachts intending to use WLO are again advised to register with them prior to departure to avoid broadcasting credit card numbers. They will also now place “collect” calls in continental US provided that the called party accepts the charges and does not have a collect call block on their telephone line. An operator is on duty 24/7.

The frequencies used by WLO Radio are:

WLO HIGH SEAS HF SSB VOICE - LOCATED NEAR MOBILE, ALABAMA

ITU	Yacht TX	Yacht RX		ITU	Yacht TX	Yacht RX
405+	4077	4369				
414	4104	4396		1226	12305	13152
607	6218	6519		1607	16378	17260
824+	8264	8788		1641+	16480	17362
830	8282	8806		1807	18798	19773
1212+	12263	13110		2237+	22108	22804
				2503	25076	26151

KLB HIGH SEAS HF SSB VOICE - LOCATED AT SEATTLE, WASHINGTON

417+	4113	4405		1209+	12254	13101
805+	8207	8731		1624+	16429	17311

+ Denotes Voice Guard, Calling, Paging, Working and Synthesized Voice WX announcements.

Note: Radio operators are now on duty 24 hours a day, seven days a week at both locations.

WLO Frequency recommendations for the western North Atlantic:

	ITU		
Daytime	1212	1641	1807
Nighttime	824	830	1212

Traffic lists and synthesized weather is broadcast at the top of every hour. For further information, WLO can be contacted at: Tel: 251 666 5110 or 800 654 5497 and Fax: 251 666 8339.

The WLO website is:

www.wloradio.com

7.2 Globe Wireless and Sea Wave (Formerly Pin Oak)

These are two of several competing commercial stations offering data transmission including e-mail for the offshore cruiser. They offer a wide variety of product. Please see their websites for more specific information.

Globe Wireless: www.globewireless.com

Sea Wave (formerly Pin Oak): www.seawave.com

7.3 SailMail

SailMail is a low cost worldwide email service set up by CCA member Stan Honey. It uses the AirMail software developed by CCA member Jim Corenman which is available free of charge.

The use of this service requires a SCS PTC-II modem (about $700 to $1,200 retail) to interface between the computer and an SSB. The cost of the service is $250 per year effective 15 Jan 04. The user is obligated to limit daily usage to ten minutes.

At this writing, SailMail transmitters are installed in North and South America plus Hawaii, Australia, Brunei, South Africa, Europe and the Med with more locations planned. The SailMail network using SSB frequencies may be used for business or personal matters. The current list of the SailMail Stations set up around the world and their frequencies may be found in the Appendix.

For more information, see the SailMail website at:

www.sailmail.com

7.4 Winlink 2000

Winlink 2000 is a network similar to the SailMail network for Hams. It provides worldwide email over the Ham radio bands using HF Pactor or VHF packet. The AirMail software is required and available free of charge for the computer to computer protocol. The use of this network is free to Ham operators with a General or above license. It cannot be used for pecuniary (involving payment of any type) communications or for any business communications including managing your investments.

For additional information, see the website at: http://winlink.org

8 SSB Simplex Frequencies (US)

The US is a member of the International Telegraphic Union (ITU) previously noted. The ITU regulates radio frequency allocations and application throughout most of the world. The Federal Communications Commission (FCC) implements these applications in the US.

Some countries take minor exception with these allocations and in the US, a few ITU marine SSB frequencies are not authorized by the FCC. US vessels are required to observe FCC regulations worldwide unless they conflict with those of the local country. For additional information, please refer to 47 CFR Part 80 – Stations in the Maritime Services, available from the FCC and also online. Caution: this is a difficult read.

The list of frequencies in the Appendix includes most of the FCC authorized simplex frequencies (some frequencies in the SSB frequency bands have special applications for other than maritime use). Since the frequencies are specific, they are also called Channels. Channels reserved for use on the Mississippi River and Alaska are included.

The cruising yachtsman is mainly interested in receiving weather broadcasts and communicating with other yachts. Accordingly, the simplex channels listed in the Appendix are the channels most often used by the yachtsman. Note that frequencies 4060, 8113 and 8128 kHz are omitted from the list. While included by the ITU, they are not authorized by the FCC and may not be used by US vessels anywhere or foreign vessels in US waters.

To maintain some degree of confidentiality, communications with shoreside facilities are usually duplex. That is, the transmit and receive frequencies are not the same. The intent of this is to allow a listener to hear only one side of the conversation. US shoreside stations are usually assigned specific duplex channels by the FCC to communicate with vessels on the high seas.

Since duplex transmissions involve two frequencies, shoreside stations use the reciprocal TX and RX frequencies of the yacht. While most modern SSBs can operate as a shore station, this sometimes requires adjustment by a technician and is not readily accomplished while underway.

Duplex channels are normally fixed on the radio by the manufacturer, usually cannot be modified and therefore are not listed in the Appendix. Most manufacturers include a listing of them.

Some marine SSB radios used the ITU number to select channels. Unfortunately, these numbers no longer seem to be available for frequencies in the 2 Meg range.

9 SSB and HAM Nets

Radio Nets are of great value to the cruising yacht. They provide weather updates, tracking, security and in many remote locations, companionship. Unfortunately, they come and go and the listing in the Appendix was probably not correct at the time of this draft. It is an indication of what is out there however, and we certainly welcome all corrections and updates.

Ham (Amateur Radio Service) is included in the list along with SSB. Note that Ham transmissions below 7300 kHz are Lower Side Band (LSB). Non-Ham licensed operators can listen to the ham bands, but not transmit on them.
Tests demonstrating proficiency are required for a license to use Ham frequencies although anything is acceptable in a bona-fide emergency.

For more information, see the American Radio Relay League website at:

www.arrl.org

10 SSB / Aircraft Shared Frequencies

A few frequencies are authorized for both marine SSB and aircraft. The range at lower frequencies is not affected in the same way as with ship or land stations because of the aircraft's altitude.

Although the frequencies listed are available, they are not necessarily monitored except perhaps by Coast Guard flights.

Yacht TX	Yacht RX	
2738	2738	
2830	2830	
3023	3023	Search & Rescue
4125	4125	
5680	5680	Search & Rescue
8364	8364	Survival Craft

11 Miscellaneous

11.1 Emergency Antennas

A big fear at sea is the loss of the mast and with it, the backstay antenna taking with it the ability to call for help when you need it. However and assuming the automatic antenna tuner is still operating, an emergency antenna is simple to fabricate and quick to install. All that is needed is some wire a little longer than the length of the boat (preferably insulated), two or three poles and a nut & bolt with washers.

Ideally, the wire should be multi strand with an insulating coating and can be of any gauge. Since this is a temporary setup, almost any wire will do and several lengths could be tied together although one piece is better. The wire could also be solid core and not insulated although insulated wire makes life easier. The poles can be mop handles, boat hooks or anything available, metal or wood. The longer the pole, the better.

To set it up, a pole should be firmly attached at both the bow and stern using duct tape or better yet, nylon electrical ties or for the best, water hose clamps. A third pole attached to a lifeline stanchion at the widest point of the boat will help to keep the crew from running into the wire and the higher the wire, the better for the same reason.

Starting at the bow, string the wire to the poles. If the wire is insulated, simply feed it through a small hole in the end of the pole and tie it back on itself. If the wire is bare and the pole is metal, it must be insulated to insure it doesn't short to ground. A piece of string will do this very nicely provided it isn't wet or, a short length of insulated wire tied in a loop or a nylon electrical tie. Ideally, a wooden mop handle or PVC tube with a hole in it at the top solves the insulation problem and works very well.

From the bow, pass the wire through the intermediate pole if there is one (insulating if necessary) and secure the wire to the stern pole making it taunt to minimize droop. Using a small bolt, two washers and a nut, wrap the bare end of this wire around the bolt along with what is left of the antenna feed cable. Tighten the nut to secure the wires between the washers. Ensure this connection won't accidentally touch the stern rail or other grounded metal by insulating it with electrical tape or even duct tape. Even a piece of plastic bag wrapped around it will do.

While this may sound too simple, it is very effective and surprisingly not as directional as might be expected. An antenna like this was rigged on my boat after the mast was removed to get under the bridges on the way to Paris. Tied alongside the high stone wall of the Bastille and amongst four and five story apartment houses, we were able to talk to yachts in Spain and Italy on occasion as well as receive WX Fax.

11.2 Phonetic Alphabet

There are occasions where spoken transmissions are not clear, particularly when spelling unusual yacht names. To clarify the spelling, the phonetic alphabet may be used.

A - ALFA	H - HOTEL	O - OSCAR	U - UNIFORM
B - BRAVO	I - INDIA	P - PAPA	V - VICTOR
C - CHARLIE	J - JULIETT	Q- QUEBEC	W - WHISKEY
D - DELTA	K - KILO	R- ROMEO	X - X-RAY
E - ECHO	L - LIMA	S - SIERRA	Y - YANKEE
F - FOXTROT	M - MIKE	T - TANGO	Z - ZULU
G - GOLF	N - NOVEMBER		

11.3 Time Signals - Radio WWV and WWVH

Radio station WWV located at Boulder, CO and WWVH at Kauai, HI respectively broadcast pertinent information to mariners in addition to the well-known time ticks. Note that these broadcasts are in AM mode rather than USB. Their broadcast schedule and frequencies are:

			WWV	WWVH
Frequency			2500 kHz	2500 kHz
Frequency			5000	5000
Frequency			10000	10000
Frequency			15000	15000
Frequency			20000	
Storm Information			H + 8 to 10min	H + 48 to 51 min
GPS Status Report			H + 14 min	H + 43 min
Geo Alerts (Time Adjustment)			H + 18 min	H + 45 min

Due to the short broadcast time for the messages, recording the transmission with a small cassette recorder is helpful.

Note to celestial navigators: The time of the earth's rotation is slightly imperfect from that of the atomic clock. When it reaches 0.9 seconds off (almost a quarter mile), an adjustment is made and announced on the Geo Alert.

11.4 Time Signals – CHU and Others

Time signals are broadcasts by many countries around the world. Canada's CHU at Ottawa can be heard over most of the north Atlantic. Their frequencies broadcast in French and English are:

3.330 kHz
7.335
14.670

Bill Hepburn in Canada has written extensively about marine related communications. For a more extensive listing of stations broadcasting time signals, please see Bill's paper on "Shortwave Time Signal Broadcasts" at:

www.iprimus.ca/~hepburnw/index.html.

Note that very precise time is available from the GPS.

11.5 Transmission Ranges

An approximation on Tx/Rx range by frequency band depending greatly upon conditions is:

Freq Band		Day	Night
2 MHz		100	300
4		300	800
6		400	1000
8		500	1200
12		2000	800
16		4000	Unreliable
22		Worldwide	Unreliable

11.6 Propagation and Grounding

Assuming the equipment is in good order and there is adequate grounding for an SSB, two types of radiation will be produced when transmitting. They are the ground wave and the (desired) propagation radiated into the atmosphere. The ground wave is a portion of the emission that radiates out at the base of the antenna on the water surface (or land) for a short distance in all directions. Sometimes the ground wave can extend several miles and can interfere with other yacht SSBs in the immediate area even if tuned to another channel.

The desired emissions from the antenna radiate out and bounce off the ionosphere, reflecting back down to earth. This reflection takes place at different altitudes depending on the frequency. Higher frequencies penetrate deeper into the ionosphere and therefore reflect back down to earth at a greater distance from the antenna than lower frequencies. As a result, higher frequencies typically but not always have greater range.

This reflection of the radio waves is what gives the great range. However, there is no free lunch and because SSB communications depend upon a reflected signal, there is a gap or blank area (in all directions) between the ground wave and the reflected transmission. This gap is called “Skip”. The higher the frequency, the greater the Skip distance. For this reason and for courtesy to other SSB stations at great distances, higher frequencies should be used only when necessary.

Restated, within limits, the higher the frequency, the greater the range but also the skip distance. From a practical aspect, a yacht in Trinidad attempting to talk to a yacht in Grenada on 12 MHz will most likely need a relay from a third yacht in at least the Bahamas or farther away because Grenada will be in the skip zone. This also means that everyone at great range will be “reading the mail”, a discourtesy to them when a 2 or 4 mHz frequency would work just fine for this short range.

All of these radiated transmissions need something to push against and that is the ground plane of the yacht. Most references cite a yacht’s ground plane should be a minimum of 100 square feet. Tops and bottoms of metal water tanks (but not fuel tanks) make excellent components of a ground system. Since the sides of tanks are normally vertical, they don’t help or count.

If you can receive but have never been heard at reasonable distances, an inadequate ground system may be the reason. If you only recently can’t be heard, the connections to the tuner and antenna are the likely cause. Or, your friends don’t want to talk to you anymore.

For an excellent discussion on this, see Eric Steinberg's article covering installation of SSB antennas and ground planes at:

http://www.farallon.us/info.htm.

11.7 Types of Emissions

There are many types of HF radio emissions. SSB transmissions as used on yachts are restricted to Upper Side Band (USB). However, the modern SSB radio will receive other types of emissions such as AM used by WWV and WWVH along with many local broadcast stations.

The coding used to identify the different emissions is significant (has meaning) and is sometimes displayed on the SSB rather than the acronym normally used to depict the emission. For example, USB could be displayed as J3E.

The following is an abbreviated Cross Reference Table:

Mode	Emission		Usual Application
AFSK	J2B	Audio Frequency Shift Keying	Aux. Equip. & RTTY
AM or DSB	H3E	Amplitude Modulation	Broadcast Radio, Etc.
CW	A1A	Continuous Wave	For Morse Code
FSK	F1B	Frequency Shift Keying	RTTY
LSB	J3E	Lower Single Side Band	Voice Telephony
R3E	R3E	Reduced Carrier	
USB	J3E	Upper Single Side Band	Voice Telephony & WX Fax

A few notes on emissions:

1. The International Distress and Hailing frequency 2182 kHz should be set to USB. Some radios have this preprogrammed to AM which is contrary to the FCC & ITU regulations. The practical implication is that a station watching 2182 kHz on USB will get only about half the AM signal.

2. AM is sometimes called Double Side Band (DSB) which may be displayed instead of AM or H3E.

3. Hams use Lower Side Band (LSB) working their frequency bands below 7300 kHz and USB above 7300 kHz. The Ham bands dovetail with but do not overlap the Marine SSB frequency ranges.

11.8 Voice of America and BBC Broadcasts

In the Caribbean, local radio stations broadcast mainly in English, but in Europe, the cruiser without a SSB can get very isolated. News and current events in English are available on SSB from many sources and among them are VOA and BBC that both have worldwide service. The frequencies and schedules change with the area, the seasons and with daylight savings time. The websites for these stations should be consulted before departure.

VOA: - Click on Schedule Information

www.voa.gov

BBC: - Click on Radio Schedules and then Short Wave Listening

www.bbc.co.uk/worldservice/schedules/

The frequencies and schedule for these broadcasting systems current in the winter 2003-2004 have been included in the Appendix.

11.9 Wind Direction

The wind in the Northern Hemisphere flows clockwise about a high and counterclockwise about a low. Simplistically, it can be expected to flow outward from a high at about 15 degrees from the isobaric lines at any point and is generally more pronounced the closer one gets to the center of the high. In the same way, the opposite holds for a low; the wind flows inward at about 15 degrees from the isobaric lines.

Given this, wind direction can roughly be determined from the synoptic chart. There are techniques to determine wind strength as well, but most importantly, the closer the isobaric lines, the stronger the wind.

The wind direction in the southern hemisphere flows in the opposite direction; highs flow counterclockwise while lows flow clockwise.

11.10 Wind Strength in the Caribbean

Typically, the wind strength in the Caribbean can be predicted as a function of the barometric pressure. This is not to suggest that the wind strength will always be consistent with the following table, but generally, the surface pressure indicated by the isobaric lines on a forecast synoptic chart depict what can be expected in wind strength:

mb	Knots
1020	15
1019	16
1018	17
1017	18
1016	19
1015	20
1014	21
1013	22
1012	23
1011	24
1010	25

Standard Sea Level

12 A Few Conversion Tables

Different measurement systems are employed away from North America and conversion tables are included in many cruising guides and almanacs for the offshore cruiser. Even mundane measurements such as atmospheric pressure is measured in different units; Pounds Per Square Inch (psi) is common in North America while weather facsimile's (WX Fax) use millibars (mb) and Europe uses hectare Pascal (hPa), the same as mb.

There should be little need to include them here except that from a practical standpoint, a conversion table for atmospheric pressure is appropriate. Unfortunately, it leads to other conversion tables. Not to be overlooked is the fact that a yacht concerned with offshore communications will have need for conversion tables somewhere along the way. From a practical standpoint, it is handy to not have to look in several different places to determine how many milliliters of oil to add to a liter of petrol (gasoline) for the outboard. The cook will also appreciate conversions to metric.

A selection of conversion tables has been included in the Appendix. Note that some rounding occurs and for greater precision, formulae should be used.