

# Lancaster Stake Personal and Family Preparedness Seminar

## “Emergency Communication and You”

Presented by Eugene D. Humpherys KG6SLC

July 2009

### Who is Eugene Humpherys?

- Licensed Amateur Radio operator KG6SLC
- Holds an EXTRA class radio license
- Volunteer examiner for GLAARG and ARRL
- Belongs to: ARES and DCS
- Established communication with Colton Storehouse
- High Desert District Emergency Coordinator for ARRL
- Runs an emergency “net” every Wednesday 7:00/pm
- Past president of AVARC 120+members (2006 & 2007)
- In charge of “Baker To Vegas” Stage 15 comm.
- Author of Public Service article published in QST magazine December 2008

### When disaster strikes....



**The time for preparation is over!**

You could be on your own for days prior to receiving assistance.

**....ARE YOU PREPARED?**

**You have to decide what is important to you?**



### HOW DO I PREPARE?

- Store food, water and supplies.
- Prepare emergency kits(short & Long term).
- Prepare sanitation kits.
- **Have a communications plan.**
- Gather important documents.
- Educate yourself.

**Why would I need a “communication plan” when my family has cell phones?**

**I’ll just give them a call.....**

## NO PHONE SERVICE ???



- Dial tone is available for only a small percentage of “connected” devices.
- During, or after an emergency authorities may restrict phone access to priority agencies.
- Phone site batteries will run out of power if not timely recharged.
- Terrorists now use cell phones or blackberries to remotely trigger destructive devices. This means that service for the general user may be shut off even if the system capable of operating.

**If your “Communications plan” is to merely give everyone in your family a cell phone, you may want to reconsider your planning strategy.**

### What about a Satellite phone?

- Satellite phones are expensive.
- If the phone system is down or restricted, who are you going to talk to?
- Would you and your satellite phone always be in the same place?
- Would whoever you are trying to call also have their satellite phone with them?



**YOUR BACKUP COMMUNICATION  
.....will be some kind of radio**

## RADIO OPTIONS



### **F**amily **R**adio **S**ervice & **G**eneral **M**obil **R**adio **S**ervice

#### ADVANTAGES

Low cost \$20-\$85/pair  
watt)  
FRS: No license required  
Small and lightweight  
Manuf.  
AA or AAA batteries  
GMRS repeaters available  
Private or “extra” channels  
Up to 50 Watts on GMRS  
462.675/MHz for Emergency  
Many agencies monitor

#### DISADVANTAGES

Short distance use (FRS=1/2  
Handheld units are low power  
Channel numbers differ by  
Many units sold  
GMRS: requires license

## FRS/GMRS Recommendations

- Get “furthest distance” model (if it says 10 miles: expect 1-2 city miles)
- Purchase units that will use AA or AAA batteries (have EXTRA on hand and ready)
- 4 battery units will typically talk longer than units with 3 batteries
- Get units capable of using all 22 Channels
- Store EXTRA batteries with radio(s) and rotate periodically
- Do NOT store radios with batteries installed as batteries may leak over time
- Set up and TEST all radios in the SAME ROOM before they are needed
- Create a “radio kit” for captains with extra batteries and manual etc.
- Get SAME manufacture and model for your group
- Keep a copy of the manual in the “kit”
- “Field Test” the radios to ensure adequate coverage and settings
- Be prepared with alternate channels if the channel you plan on using is busy

## FRS/GMRS Frequency Use

- FRS = 7 dedicated frequencies (.5 Watt max)
- FRS/GMRS = Share 7 frequencies
- FRS=.5Watt GMRS=5Watts
- GMRS = 15 dedicated frequencies (5 Watt max)
- TOTAL = 22 actual frequencies
- GMRS Base/Mobiles (not handhelds) have 8 additional repeater input Channels and can transmit up to 50 Watts on repeater output channels.
- NOTE: “Extra Channels” are actually NOT additional frequencies.

## CTCSS

### Continuous Tone Coded Squelch System

Tone	RadioShack	Motorola Sport	Motorola TalkAbout
67	1		1
69.4	2		
71.9	3		2
74.4	4		3
77	5	A	4
79.7	6		5
82.5	7		6
85.4	8		7
88.5	9	B	8
91.5	10		9
94.8	11		10
97.4	12	C	11
100	13		12
103.5	14		13
107.2	15	D	14
110.9	16		15
114.8	17		16
118.8	18	E	17
123	19		18
127.3	20	F	19
131.8	21		20
136.5	22	G	21
141.3	23		22

Tone	RadioShack	Motorola Sport	Motorola TalkAbout
146.2	24		23
151.4	25		24
156.7	26		25
159.8	27		
162.2	28		26
165.5	29		
167.9	30		27
171.3	31		
173.8	32		28
177.3	33		
179.9	34		29
183.5	35		
186.2	36		30
189.9	37		
192.8	38		31
203.5			32
210.7			33
218.1			34
225.7			35
233.6			36
241.8			37
250.3			38

When CTCSS tones are used, receiving the signal will “open” the squelch and allow you to hear the transmission ONLY when the same frequency tone is detected. Some manufactures call these “Privacy Tones”. (NOTE: The radio operator does NOT hear these tones)

**“EXTRA” Channels**  
are actually Existing frequencies using “Privacy Tones”

MIDLAND CH	FREQ	FRS/GMRS CH	ZONE	MIDLAND TONE NUMBER
23	462.5625	1	250.3	38
24	462.6125	3	225.7	35
25	462.6625	5	203.5	32
26	462.7125	7	179.9	29
27	462.55	15	162.2	26
28	462.6	17	146.2	23
29	462.65	19	131.8	20
30	462.7	21	118.9	17
31	462.5875	2	23 DCS	1
32	466.6375	4	31 DCS	4
33	462.6875	6	47 DCS	7
34	467.5625	8	65 DCS	10
35	467.6125	10	73 DCS	13
36	467.6625	12	115 DCS	16
37	467.7125	14	131 DCS	19
38	462.575	16	143 DCS	22
39	462.625	18	156 DCS	25
40	462.675	20	172 DCS	28
41	462.725	22	223 DCS	31
42	462.5625	1	107.2	14

**Excluding repeater inputs there are only 22 actual frequencies for FRS / GMRS**

### Citizens Band



#### ADVANTAGES

Can use external antenna  
Moderate cost \$35 - \$150  
40 channels  
Channel 9 for Emergency  
SSB mode will travel further

#### DISADVANTAGES

Crowded airwaves  
Short distances  
Up to 5 watts  
Undisciplined users

#### CB Recommendations

- SSB mode
- Get a name brand
- Use efficient antenna
- Tune the antenna
- Have a backup power source
- Older units do not have 40 channels

## Multi Use Radio Service



### ADVANTAGES

Well built & rugged  
No license required  
Can use external antenna  
Use with Voice or Data

### DISADVANTAGES

Cost \$100 - \$150 per unit  
Few channels (five)  
Short distance  
Up to 2 watts  
Channels are shared  
No repeaters allowed

## Commercial/Business Radios

Other radios such as new or used business/commercial radios are available and can often be had at reasonable cost. However, keep in mind that these radios usually still require a license to be operated legally. Having such a radio would then give you the ability to communicate with others that use such radios, as they would still operate in the same band. So, if you feel the need to communicate on the same frequency as taxi drivers you are in luck as there are some deals out there. You should consider, however, using these radios would render you, and/or your ward, incompatible with other wards, the stake, and amateur radio operators. But, on the upside, if you ever need a taxi.....

## Amateur (Ham) Radios



### ADVANTAGES

Need a license  
Long distances  
Reliable  
Multi modes  
Can use Higher Power  
Can use external antenna  
People and agencies monitor  
Many radios have "wide receive"  
including public safety & standard  
broadcasting stations.

### DISADVANTAGES

Need a license  
Higher costs \$100-\$1000  
Can be addicting

# HAM RECOMMENDATIONS

- Get all mode radio (if budget allows)
- Do not scrimp on antenna
- Wide receive can include:
  - Public broadcast
  - FRS/GMRS & CB
  - AM band & FM band
- Have a backup power source
- Keep a copy of the manual with radio
- Program needed frequencies for ease of use

**How can I find out if there are any amateur radio operators in my neighborhood?**

## TO FIND AMATEUR RADIO OPERATORS (HAMS)

go to [www.qrz.com](http://www.qrz.com)

To search by callsign enter callsign here

Then click "Search"



To search by information other than callsign scroll down until you see "database" on the left side of the screen. Click on "database"



go to [www.qrz.com](http://www.qrz.com)

Enter the data on which you wish to search in the box.

You may search by:

Call Sign  
Name  
Street  
City  
Zip Code  
State  
etc.

Click "Search"

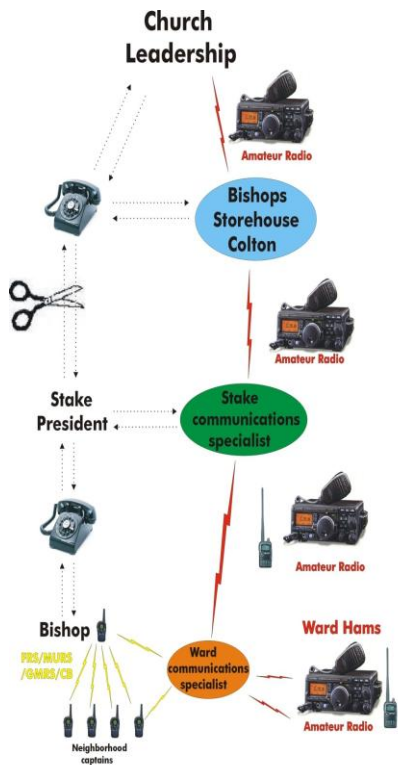


The results of your search is shown.

If you searched by call sign your screen looks like this



To get additional detail click here



If the phones aren't working, the LDS Church's communication plan revolves around Amateur Radio.

- Area Captains report to Bishop
- Bishop reports to Stake President
- Stake President reports to Colton
- Colton reports to Church Headquarters

**When you realize that being able to communicate with your loved ones in an emergency is important to you, and will add to your peace of mind, it may be that becoming an amateur radio operator will be part of your communication plan**

## STUDYING FOR YOUR AMATEUR RADIO LICENSE

- Self study (make sure your manual is current)
- Group classes are available
- Internet sites that have test questions
  - Qrz.com
  - Hamtestonline.com
  - Arrl.org
  - Hamtests.net
  - Hamtesting.com
  - Aa9pw.com

Online practice tests use actual questions taken from the pool you will be asked when you take your amateur radio test. At the end of each online test you are presented with your score and whether or not you would have passed with that particular test. Typically your online score will be within a couple of points of your actual test score. Using these online tests is a good way to determine that you are ready to pass the written test.

## QUESTION POOL

TOPIC	TOTAL	EXAM
FCC Rules	64	5
Methods of Communication	35	2
Radio Phenomena	25	2
Station Licensee Duties	37	3
Control Operator Duties	34	3
Good Operating Practices	37	3
Basic Communications Electronics	51	3
Good Engineering Practice	104	6
Special Operations	41	2
Electrical, Antenna Structure & R F Safety	82	3
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TOTALS	510	35

## Useful Frequencies

<b>General Mobile Radio Service (FM only) 5 Watts handhelds / 50 Watts Base &amp; Mobil</b>							
1 Rpt Out/simplex 1 =	462.550	9 Rpt Out/simplex 5 =	462.650			16 Rptr inpt(1) =	467.550
2 Shared with FRS	462.5625	10 Shared with FRS	462.6625			17 Rptr inpt(2) =	467.575
3 Rpt Out/simplex 2 =	462.575	11 Rpt Out/simplex 6 =	462.675			18 Rptr inpt(3) =	467.600
4 Shared with FRS	462.5875	12 Shared with FRS	462.6875			19 Rptr inpt(4) =	467.625
5 Rpt Out/simplex 3 =	462.600	13 Rpt Out/simplex 7 =	462.700			20 Rptr inpt(5) =	467.650
6 Shared with FRS	462.6125	14 Shared with FRS	462.7125			21 Rptr inpt(6) =	467.675
7 Rpt Out/simplex 4 =	462.625	15 Rpt Out/simplex 8 =	462.725			22 Rptr inpt(7) =	467.700
8 Shared with FRS	462.6375					23 Rptr inpt(8) =	467.725
<b>Family Radio Service max .5Watt(FM only) (no license required) [GMRS 5 Watts license required]</b>							
GMRS=OK/FRS1	462.5625	NO=GMRS/FRS8	467.5625				
GMRS=OK/FRS2	462.5875	NO=GMRS/FRS9	467.5875				
GMRS=OK/FRS3	462.6125	NO=GMRS/FRS10	467.6125				
GMRS=OK/FRS4	462.6375	NO=GMRS/FRS11	467.6375				
GMRS=OK/FRS5	462.6625	NO=GMRS/FRS12	467.6625				
GMRS=OK/FRS6	462.6875	NO=GMRS/FRS13	467.6875				
GMRS=OK/FRS7	462.7125	NO=GMRS/FRS14	467.7125				
<b>Multi Use Radio Service 2 Watts (license no longer required)</b>							
	151.820		151.940			154.600	
	151.880		154.570				
<b>Citizens Band 5 Watts License required (AM &amp; SSB)</b>							
Channel 1	26.965	Channel 11	27.085	Channel 21	27.215	Channel 31	27.315
Channel 2	26.975	Channel 12	27.105	Channel 22	27.225	Channel 32	27.325
Channel 3	26.985	Channel 13	27.115	Channel 23	27.255	Channel 33	27.335
Channel 4	27.005	Channel 14	27.125	Channel 24	27.235	Channel 34	27.345
Channel 5	27.015	Channel 15	27.135	Channel 25	27.245	Channel 35	27.355
Channel 6	27.025	Channel 16	27.155	Channel 26	27.265	Channel 36	27.365
Channel 7	27.035	Channel 17	27.165	Channel 27	27.275	Channel 37	27.375
Channel 8	27.055	Channel 18	27.172	Channel 28	27.285	Channel 38	27.385
Channel 9	27.065	Channel 19	27.185	Channel 29	27.295	Channel 39	27.395
Channel 10	27.075	Channel 20	27.205	Channel 30	27.305	Channel 40	27.405
<b>Aviation</b>							
Emergency	121.500	243.000					
Flt Advisory	122.000	255.400					
Flt Service	122.200	123.600					
Unicom	122.700	122.800	122.95	123.000			
Search & rsc	123.100						
SAC Primary	311.000						
SAC Secondary	321.000						
USCG Primary	381.800						
Airline support	460.650	to 460.875					
<b>NOAA Weather Broadcasts</b>							
162.550	162.400	162.475	162.425	162.450	162.500	162.525	

# HAM RADIO AND EQUIPMENT OPTIONS

Items in **BLUE** are recommended.

ANTENNA						
2m/440	MODEL	DESCRIPTION		FREQUENCY COVERAGE	PRICE	POWER USAGE
	G6-270R	2m / 70cm Hustler Dual Band		6/db 2m=4MHz 70cm=10MHz	\$199.95	
	GP-9	2m / 70cm Comet Dual-Band		8.5/2m 11.9/70cm	\$199.95	
	CX-333	2m / 220/ 70cm Comet Tri-Band		6.5/2m 7.8/220 9.0/70cm	\$179.95	
<b>HF</b>						
	G5RV	3.5/MHz - 30/MHz 2/Kw Dipole 102/ft			\$59.95	
	BWD-90	1.8/MHz - 30/MHz Broadband folded 2/Kw dipole			\$199.95	
	MFJ-1798	80 thru 2 meter vertical		80/40/30/20/17/15/12/10/6/2 meters	\$289.95	
	CHA250B	80 thru 6 meter vertical		80/40/30/20/17/15/12/10/6 meters	\$439.95	
<b>TRANSCEIVER</b>						
<b>2 meter</b>						
	FT-2800M	T=144-148 R=137-174+Wx		65W 2m	\$ 159.95	10Amps @13.8v
<b>2 meter VHF/440UHF</b>						
	FT-7800R	108-520, 700-990/MHz	D	50W 2m / 40W 440	\$ 254.95	8.5Amps @ 13.8v
	IC-208	118 - 999.99/MHz (single receive only)	S	55W 2m / 50W 440	\$ 329.95	11.5Amps @ 13.8v
	DR-620T	88-108, 108-174, 335-480/MHz	D	50W 2m / 35W 440	\$ 339.99	11Amps @13.8v
	FT-8800R	108-520, 700-1/GHz	D	50W 2m / 35W 440	\$ 364.95	8.5Amps @ 13.8v
	IC-2720H	144-148 / 440-450MHz (118-175, 375-550,810-999/MHz)	D	50W 2m / 35W 440	\$ 369.00	12Amps @13.8v
	DR-635T	88-108, 108-174, 335-480/MHz	D	50W 2m / 35W 440	\$ 369.99	11Amps @13.8v
	TM-V708A	136-175, 300-524, 800-1300/MHz	D	50W 2m / 35W 440	\$ 399.99	11.5Amps @13.8V
	TM-D700A	144-148 / 440-450MHz (118-1300/MHz)	D	50W 2m / 35W 440	\$ 510.00	11.5Amps @13.8V
	ID-800H	118-173, 230-549, 810-999/MHz	D	55W 2m / 50W 440	\$ 610.00	12Amps @13.8v
<b>10m/6m/2m/70cm</b>						
	FT-8900R	28-29.7, 50-54, 108-180, 320-480, 700-958/MHz	D	50W 10/6/2 35W 70cm	\$ 424.95	8.5Amps @ 13.8v
<b>HF/6m/2m/70cm</b>						
	FT-857D	.1-56, 76-108, 118-164, 420-470/MHz		100W HF 50W 2m 20W 70cm	\$ 684.95	22Amps @13.8v
	FT-897D	.1-56, 76-108, 118-164, 420-470/MHz	D	100W HF 50W 2m 20W 70cm	\$ 899.95	22Amps @13.8v
<b>POWER &amp; MISCELLANEOUS</b>						
	Ground rod	8' Minimum (Home Depot)				
	Pwr Sup. DM-330MV	5-15VDC		32/Amp Peak 30/Amp Continuous	\$ 149.95	
	Solar Panel(s)	5w panel=\$50, 75w panel \$490				
	Generator	Honda EU1000iA2				
	AGM Battery				\$ 90.00	
	Trickle charger				\$ 40.00	
	Coax PL259	UHF Amphenol connector \$2.69/ea				
	9913	50-450/MHz Flexible Bulk \$.69/ft				
	9913	50-450/MHz Flexible w/UHF Connectors 50'			\$ 48.95	
	9913	50-450/MHz Flexible w/UHF Connectors 100'			\$ 98.95	

NOTE: Some models such as the **FT-8800R** are actually two radios in one. The LEFT side can operate independently from the RIGHT side. This allows monitoring specific frequencies on one side while scanning other frequencies (such as public service or another amateur channel or band) on the other side. Both sides can scan programmed memory channels or a range of frequencies. Many models including the FT-8800R will allow programming from a laptop or other computer for easy, uniform setup.

**WHO TURNED THE LIGHTS OUT?**  
(Sung to the tune “Who Let The Dogs Out?”)



I recommend always running your radio(s) from a battery and using a “float” charger to maintain the battery charge. That way when the power goes out everything is already in place and fully charged.

**FOR ANY BATTERY**

- Protect the battery terminals to avoid shorting.
- Use correct fuses.
- Insert fuses at battery connection.
- Maintain the charge of the battery with a charger designed for that battery chemistry.

Monitor voltage as battery is discharged to avoid damaging the battery.

**LEAD ACID CAR BATTERY**



- Gives toxic/flammable fumes while charging.
- Has a smell, particularly when being charged.
- Will leak highly corrosive acid if damaged.
- Reducing voltage below specific levels will severely affect battery life.
- Not considered safe in habitable areas.
- Must ALWAYS be upright. (Battery plates must be flooded with electrolyte)

**GELL CELL BATTERIES**



- Will bulge and may leak highly corrosive acid if quickly charged or discharged.
- Draining the battery to a voltage below a specific level will severely affect battery life.
- Can be mounted in any position.
- MUST be charged at a lower charge rate and voltage to avoid battery damage.
- Rapid charging and/or discharging WILL damage the battery.

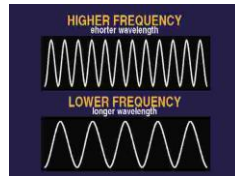
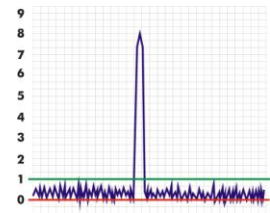
**ABSORBED GLASS MAT BATTERY- Deep Cycle Version Also Available**



- Does not emit fumes while charging or discharging.
- Will not leak even when case is broken.
- Considered safe enough to ship UPS.
- Can be mounted in any position.
- Oxygen & Hydrogen recombine 99+% while charging to prevent electrolyte loss.
- Very low self discharge 1% - 3% per month.
- Will cost 2–3 times as much as “Flooded” batteries

# Understanding Radio Terms and information

Think of the SQUELCH control as a “Noise Gate” to suppress unwanted noise and allow only signals stronger than the “background noise” to be heard. The squelch should be set to just above the “static (or noise)” level to allow weak signals to still be heard. Setting the squelch level too high will not ”open” the squelch to allow signals below the squelch level to be heard.

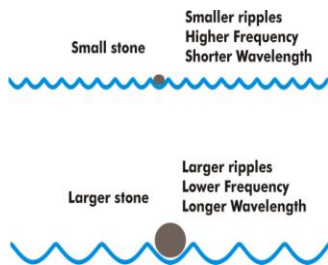


A basic component of radio is Frequency

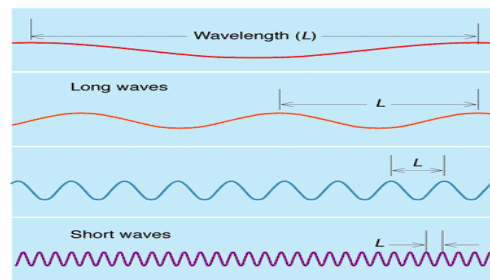
**HERTZ** means Cycles Per Second

1,000,000,000 Hz	is equal to...	(Hertz)
1,000,000 KHz	and equal to...	(Kilohertz)
1,000 MHz	and is also equal to...	(Megahertz)
1 GHz		(Gigahertz)

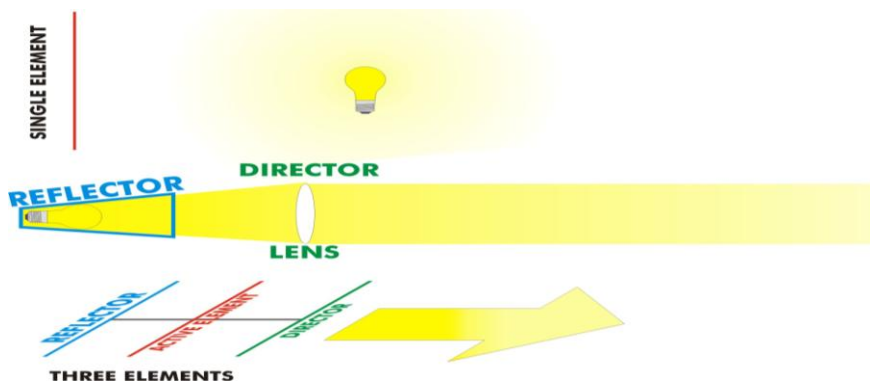
## WATER WAVE EXAMPLE



## A CLOSER LOOK

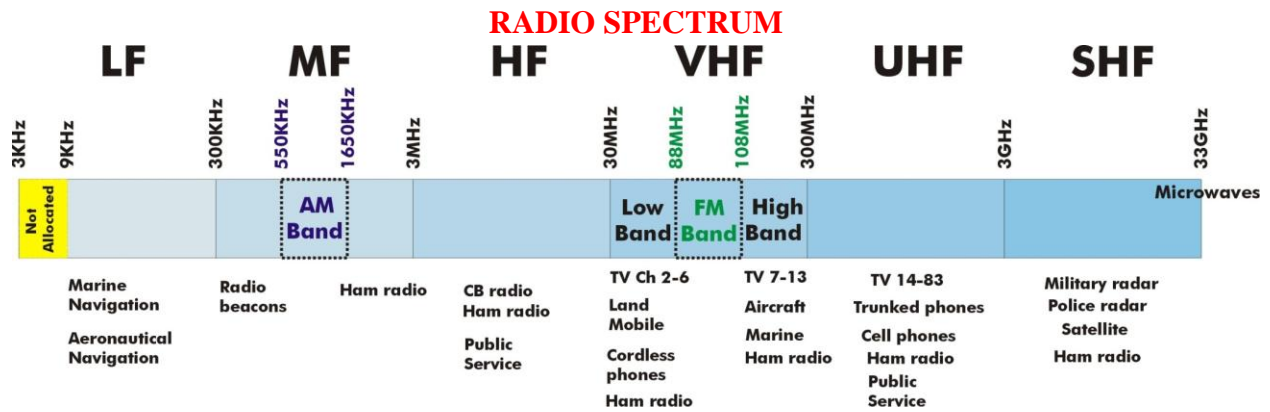


## ANTENNAS and GAIN

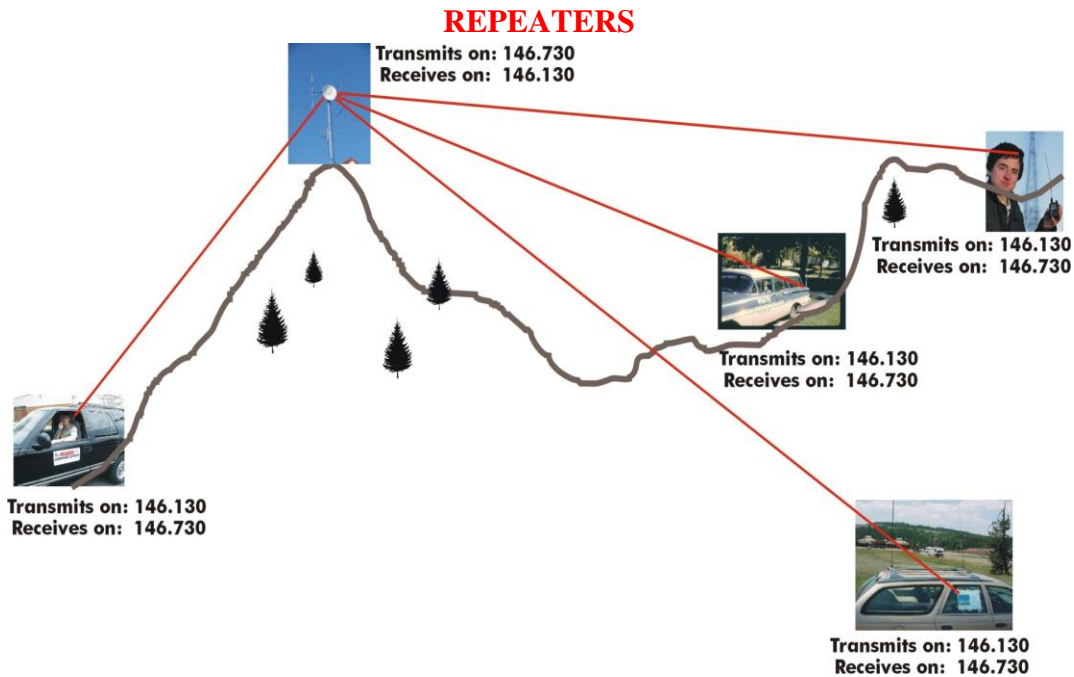


A single element antenna is like having an unshielded light bulb in that it radiates equally in all directions. In the same manner that a reflector in a flashlight reflects the light beam, a properly placed antenna element reflects the electronic signal. Continuing with the flashlight analogy,

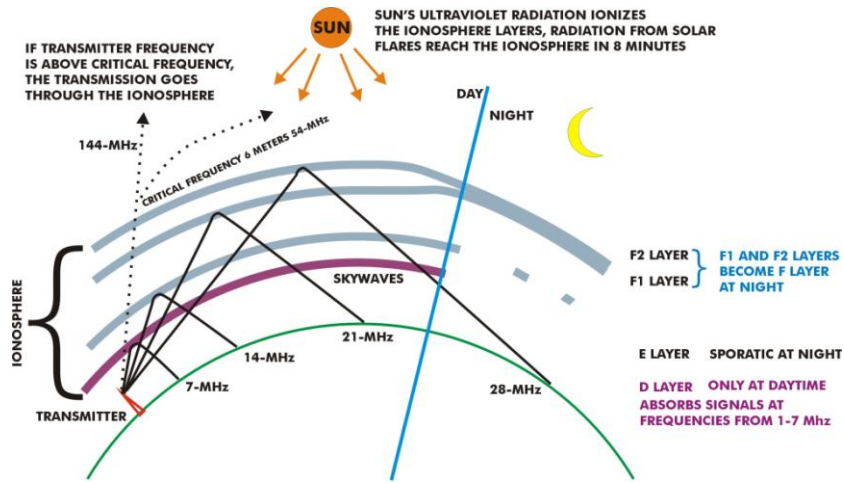
some flashlights, such as Maglights, have an adjustable lens that will direct and concentrate the light beam. In much the same way a properly placed director element will concentrate the electronic signal in the desired direction. An efficient antenna in itself does not amplify the signal. It will merely redirect the electronic signal to concentrate it in the desired direction thereby appearing to increase the strength of either the transmitted or received signal. Every 3db in antenna gain doubles the signal strength.



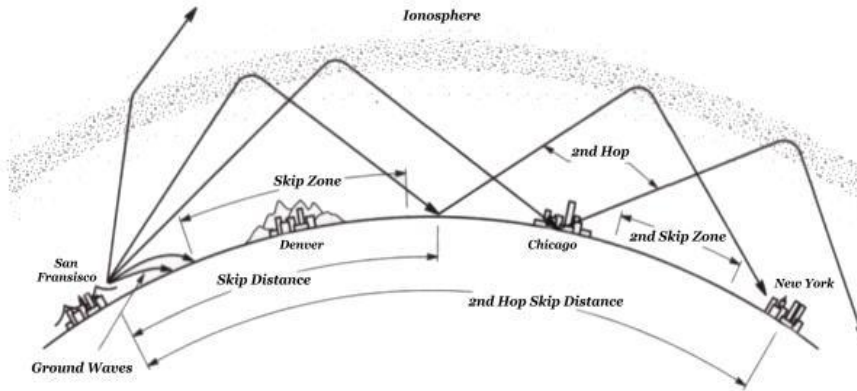
Lower frequencies will tend to find their way around the curvature of the earth while higher frequencies will travel more in a straight line. Microwaves are at the upper end of the spectrum and are highly directional. This is why microwave antennas are pointed exactly at their target. Microwave signal strength falls dramatically if either the transmitter or receiving antenna becomes repositioned even a few degrees such as might occur as a result of an earthquake. Because of their “line of sight” propagation VHF and UHF signals are frequently used in conjunction with a repeater. This allows the signal to be used at greater distances and across mountains and/or other obstacles that would not permit radio-to-radio communications.



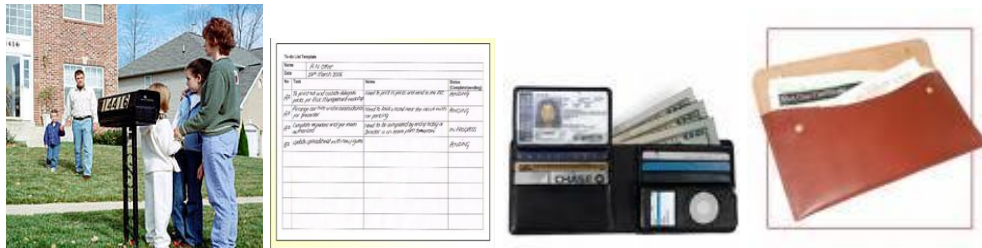
# IONOSPHERE LAYERS



Some radio waves will bounce off the ionosphere  
And continue “bouncing” around the world



# PLANNING FOR EMERGENCIES



In addition to Communication plans you and your family should plan for: meeting places, emergency cards, some cash and copies of important documents.

## Where Do I Meet My Family?



- Have a predefined location, and an alternate, where all family members can meet.
- Have an out of the area friend/relative willing to relay messages to other family members.
- Make sure everyone knows when to meet.



### Make an “EMERGENCY” Card

Include names, addresses, and phone numbers of relatives and friends. Make copies and have them laminated for your wallet/purse and put in each go bag.



### Emergency Cash

Include in your action plan a sufficient amount of cash to get you through the emergency period. If you have the option to purchase food, gas or other emergency supplies you will need cash to do so. Store emergency cash in **SMALL bills**—ones, fives and tens are best.

Remember, if all you have are \$20 bills **EVERYTHING** you purchase will most likely cost you \$20.

### IMPORTANT DOCUMENTS



You’ll also need insurance policies, birth certificates and other vital records after a damaging earthquake or other disaster. This personal information is necessary for insurance claims and other matters. Keep important items and documents and/or copies of them in a safe deposit box, fireproof storage box, freezer or another safe place.

- Social Security card
- Birth Certificate
- Marriage and death records
- Drivers’ licenses
- Credit cards
- Insurance policies
- Recent Income Tax Returns
- Paycheck stubs
- Deeds
- Stocks & Bonds
- Wills
- Recent photos for I.D. purposes (particularly of children)

### Storage Tips



- Fireproof storage box or safe deposit box.
- Freezer (tightly seal documents in a freezer bag.)
- Store documents in the home of an out of the area contact. (In this case send only **COPIES** and not the originals.)