

Ham Radio and Scouting

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Ham Radio has much in common with Scouting.

Boy Scouts

- The Radio Amateur's Code is similar to the Boy Scout Oath.
- Camping: many hams like to camp out in the outdoors and operate their small backpack radios from remote areas, such as mountain tops and islands.
- One of the options of the Radio Merit Badge is Amateur Radio.
- Weather: many hams are National Weather Service Skywarn storm spotters. Hams maintain an amateur radio station at the NWS office at the airport.

Cub Scouts

Although there is not a "Radio" belt loop for Cub Scouts, Amateur Radio does relate to many of the other belt loop academic awards.

- Citizenship: hams perform a lot of public service work. We maintain radio stations at hospitals, and many emergency operation centers. We assist the Red Cross, the Salvation Army, The Baptist Men's Kitchen, FEMA, the Texas State Guard, the National Weather Service, and many other organizations in providing for their communications needs. In time of a disaster hams provide essential communications when regular means of communication are damaged. We provide communications for bike races and marathons including the MS 150, and the Beach to Bay Marathon Relay Race in Corpus Christi.
- Science: When hams want to repair their equipment, or build their radios from scratch they need to be familiar with various scientific and engineering principles especially about electronics theory. This information is available in reference books written just for hams. The basics of radio are part of the laws of Science. A radio will not work if the builder has not studied the radio theory presented in science text books.
- Astronomy: Some of the most interesting and important telescopes do not produce images of visible light, but instead record the radio waves coming from far away stars. These machines are called radio telescopes. They are really very sensitive receivers that can listen to the sounds that radio waves from the far reaches of space make. The Very Large Array (VLA) in Socorro, New Mexico is a radio telescope.
- Collecting: Hams are great collectors. They will collect just about anything such as Morse code keys, vacuum tubes, antique radios, etc.
- Communicating: Hams are one of the best groups of communicators. On the radio you need to be able to express yourself clearly and concisely. You can also communicate with someone who only knows an unfamiliar foreign language if you know the common terms used in Amateur Radio. Hams can communicate via voice, Morse Code, or send messages digitally in the form of emails without the use of an Internet connection.
- Computers: Most hams are computer savvy. By connecting a computer to a radio they can send emails to each other using radio waves.
- Geography: Most hams who communicate with hams in foreign countries become very interested in geography. This is a natural desire after speaking to someone far away.

- Map and Compass: Hams have always been interested in maps since they often need to point their directional antennas towards a certain country. In fact many hams utilize a map that very few people are familiar with: an azimuth equidistant map.
- Mathematics: Knowing a bit of mathematics is very useful to a ham radio operator. Antennas are cut to specific lengths based on special mathematical formulas. Electronic circuit design requires a lot of math.
- Photography & Reading and Writing: Hams like to publish articles in radio magazines and on websites about their field trips and radios that they have built. Photography and writing skills are a very important part of this. Reading and comprehension are essential if you want to pass your radio amateur examination to become a ham, and afterwards when you want to build a piece of equipment or make a simple antenna.
- Weather: The National Weather Service uses hams to track weather. Weather radar can not easily track low altitude weather such as tornadoes, hail, and flooding. Hams trained as Skywarn observers do much of this work.
- Wildlife Conservation: Many animals that are being studied wear radio tracking collars. Sometimes scientists lose track of an animal. Hams often help the scientists track down the location of the missing animal. Hams are good at tracking hidden transmitters and finding an animal with a tracking transmitter on its collar is no different.

What Is Ham Radio?

“Ham Radio” or Amateur Radio is a licensed service under the auspices of the Federal Communications Commission (FCC). In its charter its purpose is clearly defined as:

- (a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing *emergency communications*.
- (b) Continuation and extension of the amateur's proven ability to contribute to the *advancement of the radio art*.
- (c) Encouragement and improvement of the amateur service through rules which provide for *advancing skills* in both the communications and technical phases of the art.
- (d) *Expansion* of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.
- (e) Continuation and extension of the amateur's unique ability *to enhance international goodwill*.

Amateur Radio operators have a Code of Conduct that is very similar to the Boy Scout Oath. It was written by Paul M. Segal in 1928.

The Radio Amateur is:

CONSIDERATE...

Never knowingly operates in such a way as to lessen the pleasure of others.

LOYAL...

Offers loyalty, encouragement and support to other amateurs, local clubs and the American Radio Relay League, through which Amateur Radio in the United States is represented nationally and internationally.

PROGRESSIVE...

With knowledge abreast of science, a well-built and efficient station and operation above reproach.

FRIENDLY...

Slow and patient operating when requested; friendly advice and counsel to the beginner; kindly assistance, cooperation and consideration for the interests of others. These are the hallmarks of the amateur spirit.

BALANCED...

Radio is an avocation, never interfering with duties owed to family, job, school, or community.

PATRIOTIC...

Station and skill always ready for service to country and community.

There are about one-and-a-half million hams throughout the world having fun while communicating in some way with each other using radio as the principal medium. About half of all hams live in the United States. Many people use the Internet every day to communicate using email, but hams can do email without the Internet or any phone lines. This makes them a very valuable resource in emergencies when traditional methods of communications have been destroyed.

If you ask 100 hams about what ham radio is you will get 100 different answers. That is a great feature of Amateur (Ham) Radio. There are so many different things that you can do in this hobby that it would take a single individual 10 lifetimes to do them all. If you got tired of doing one thing there would always be another thing you could do that would be very interesting.

Kids and Ham Radio

There is no minimum age for obtaining a ham license. Kids can participate alongside adults. We have had twelve year old hams help out at public events and end up participating in actual emergency medical incident responses, so age is not a barrier to providing service to the public. This is a great way to practice social communications skills and help build self esteem in young people. Kids can build their own radios, participate in public service events, talk to an astronaut on the International Space Station, and all other ham activities just like adults. Ham Radio is a great way for teachers to introduce technology to their students.

Who We Are

We come from all walks of life. Many of us are not technically oriented: men, women, children, teachers, clerks, accountants, lawyers, police officers.....you name it.

Qualifications

The FCC regulates ham radio. You must pass a simple test to obtain a license. The test is geared for a 10 year old's skill set. An adult can pass the test in a week of casual study. Many children depending on their age can pass the test after about three weeks of study. The license manual is normally \$33 including shipping, but our club sells them for \$20. We have some available now. Knowing Morse code is no longer a requirement for licensing.

Contact information

The South Texas Amateur Radio Club (STARC) meets on the fourth Thursday of every month except November (3rd Thurs.) and December at the Mount Olive Lutheran Church, 5101 Saratoga, at 7 pm. Call Steve, W2MY first. He can be reached at 361-949-7632, or steven (atsign) pituch (dotsign) net. STARC has a nice website with a lot of good information at: www.n5cp.org. STARC also has weekly on-the-air meetings.

The ARRL (American Radio Relay League) is the voice of Amateur Radio in the USA. They have study materials to help people obtain a ham license. They also have teaching aides for teachers wanting to use ham radio in the classroom. They are at: www.arrl.org.

Things that Hams Do

This is just a short list of activities. There are thousands of others also.

Emergency Preparedness

The Internet, police trunking systems, cell phone systems, etc, all have one thing in common. They require a lot of modern equipment and maintenance to run, and can take many months to establish. We call all of this: "Infrastructure". The problem with these "modern" communication systems is

that they rely on a large amount of infrastructure, and when they are damaged or destroyed, they can take months to reestablish. This is where Amateur Radio comes into play. The systems that hams use require very little infrastructure to establish. Typically a ham can set up a communications link within one hour with a suitcase full of modest equipment. These communication links are just as effective as your cell phone or Internet, except these other systems will likely not be available after a disaster. If the DPS (State Police) needs to send a casualty list to Austin, or the Red Cross needs blood, the request will likely be transmitted via Ham Radio. This has been proven many times after a disaster such as the Haiti earthquake, Hurricanes Katrina, Dolly, and Ike, the tsunami that affected the Andaman and Nicobar Islands, and the Oklahoma City Federal Building, and World Trade Center bombings. Often ham radio is the only means of communication for many weeks after such an event.

The amount of equipment needed to do this kind of emergency preparedness work is not necessarily very expensive. Hams practice for real emergencies during training exercises. Locally hams help the DPS, the Corpus Christi Office of Emergency Management, Driscoll Children's Hospital, the Salvation Army, the Red Cross, and the federal government (FEMA) and we provide HF (high frequency) email communications for the Texas State Guard through the Military Auxilliary Radio System (MARS).

Field Day

This is an annual event that has been taking place since about 1932. Hams assemble their stations in the field and use emergency power to contact as many other hams as possible in a 24 hour period. It is in the form of a contest, but its purpose is for us to practice our skills for real emergencies. Much of the equipment that you will see at Field Day is what is used during disaster relief work.

Public Service

With all the emergency preparedness practice, hams also like to practice in real situations. So they volunteer to provide communications for bike races like the MS 150, foot races like the Beach to Bay Run here in Corpus Christi, and other public events. Hams often are the ones who report injuries and transmit the victim's essential medical information from the first responders at the incident to medical authorities. This is a great way to give back to the community, and have a lot of fun doing it since you are using your hobby to help others.

Ragchewing

"Chewing the Rag" just means having a good time talking with another ham on your radio. With Ham Radio you can contact hams throughout the world without any wires or the Internet. You can do this at any time as there is always a ham somewhere in the world looking for a contact. See the cards in this display for countries I have contacted hams in. I have talked to sheep ranchers in Western Australia 200 miles from a phone, UN workers in Rwanda and Lebanon, hams in Iceland, and Ascension and Mauritius Islands. You learn a lot of geography being a ham, and how people throughout the world are really the same as you and me. Ham Radio becomes a great equalizer and teaches one respect for other cultures all over the world. When I was young and the Cold War was in full swing as a child like many I was afraid of the Russian Communists. But my father who was a ham would communicate with Russian soldiers on the Manchurian border. Ham radio tends to be a brotherhood that transcends the political differences that countries' governments sometimes have.

Contesting

During a radio contest tens of thousands of hams get on their radios and try to contact as many other hams as possible during an allotted time period. There are many kinds of contests. Some stress

emergency preparedness such as Field Day. Some stress the number of different states or countries that you contact. Some stress using as little power as possible. All are fun. At the end of the contest you submit your log sheet to the event coordinator. Prizes or awards are often given to those with the highest scores.

Awards Chasing

Awards chasing is making radio contacts with the goal of achieving the minimum requirement for a certain certificate. For example, you can get certificates for contacting hams in all 50 states, or contacting hams in 100 countries, or in all 3143 US counties. This can become a long term goal as some of these certificates can require years of radio operation in order to obtain the necessary contacts.

QSL Cards

How do you verify that you have made a valid contact for an award? Hams usually ask for confirmation in the form of a signed post card. This is called a QSL card. This card also has the specific information on the card about the contact. Examples of these cards are shown throughout this exhibit. Did you know that Bailiwick of Guernsey is a ham radio country? Do you know where it is? (Find the card on the display!) You learn a lot of things you would ordinarily not know when you are a ham.

QRP

QRP is a “Q” sign, or abbreviation, used in Morse code to indicate to you to reduce your transmitted power. Often 5 Watts of transmitted power is sufficient for making a contact, and using 100 Watts is wasteful. A large group of hams like to operate QRP, where they use no more than 5 Watts of transmitted power. This can be fun. You can make your own QRP radio cheaply since the cost of a radio is proportional to its output power. You could build an entire 5 Watt radio station with antenna for less than \$100. Then you could contact other hams with it throughout the world. The radio could be small enough to fit inside an Altoids candy tin and weight less than two ounces.

Modes

Hams have many ways (modes) in which they can communicate. Voice is the most common mode, but Morse code is still very popular even after it was no longer a licensing requirement. A Morse code radio can be made very cheaply and small, and are popular with backpackers. There are also many digital modes. To use a digital mode you connect your PC to your radio via the PC's soundcard. You type on the keyboard what you want to transmit, and receive the others station's text on the computer screen. It is sort of like the old teletype systems, but with the PC, digital communications has been made very inexpensive and reliable. The most popular mode for emergencies is wireless email. The Internet can be destroyed all around a ham but he can connect to it by way of another radio thousands of miles away. There are other more unusual modes like orbiting communications satellite and moon bounce.

Radios

The cost of radios start at about \$100. On VHF (Very High Frequency) FM you can talk to others on a small handi-talkie, or use a mobile version in your car. With FM VHF repeaters you can communicate within about a 50 mile radius of the repeater. Corpus Christi has many amateur radio repeaters that you can use.

With a 5 to 100 Watt HF, high frequency, (world band) radio you can talk to other hams world wide. QRP (5 Watt) HF (High Frequency) radios can fit inside a shirt pocket.

Summary

Ham Radio is a great hobby for kids and adults alike. It is potentially a great technology, civics, geography, communications, and human relations teaching tool in our schools, and in our adult lives. It is also a great way to do some public service for your community and have fun doing it.

Follow Up

If you have any questions about ham radio, please contact Steve, W2MY, at 361-949-7632, or steven (atsign) pituch (dotsign) net.



Kids and Ham Radio

Left: Making contacts world wide during Amateur Radio Field Day.

Right: Operating an HF world band radio (48 states confirmed).



Left: Building an HF radio from a kit of parts.

Right: Providing communications at a checkpoint during a running race.



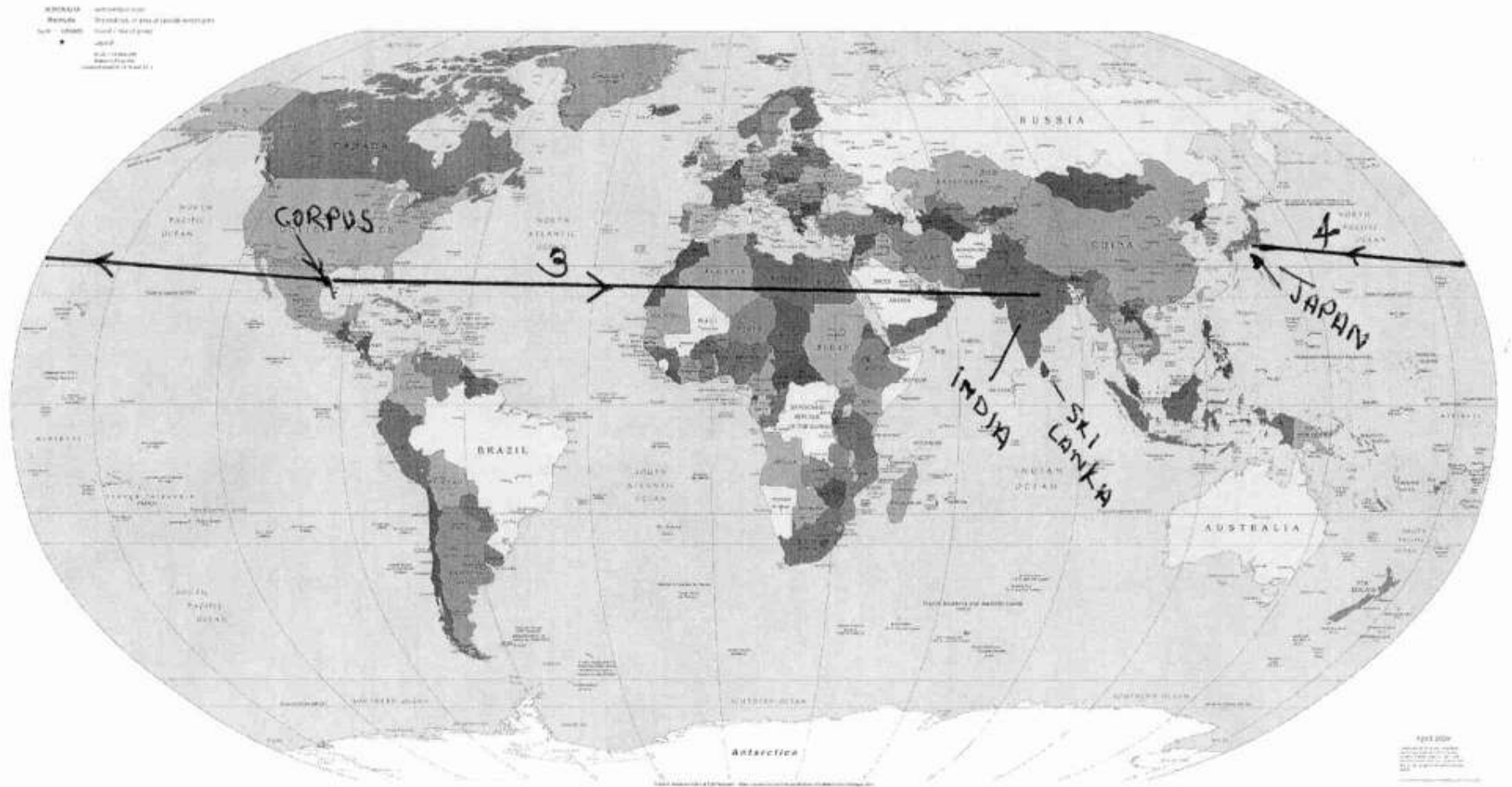
Compass & Map Reading

We have all used world maps before. However, a map is a flat representation of the surface of a sphere and therefore introduces distortion. The *Mercator Projection* maps that we are mostly used to are good to show the general relationship between countries, but are inaccurate for direction and distance measurements.

Hams need to aim their antennas at certain countries in order to communicate with hams throughout the world. The normal flat projection map is not very good at helping us in this regard. For example in the map on the next page the direction to India from Corpus Christi is east and to Japan it is west. These are not the true directions to these countries. There is a type of map called an *Azimuthal Equidistant Projection* map that is drawn in such a way as to show the correct angle (direction) and distance to any location on the earth. The only problem is that the map is different for every location in the world. Fortunately, with a computer one can use a program to make an Azimuthal map of any location in the world. I have made one for Corpus Christi and included it on page 11. With this map you can accurately measure the compass direction and distance from Corpus Christi to any part of the world. With this information a ham can aim his antenna and determine the best frequency to make communications with a ham in that country. This is just one example of how hams use special maps and science in their hobby.

Notice that on the Azimuthal map that Corpus Christi is at the exact center of the map. Also note that there are compass lines radiating around that point. Notice that the direct and shortest distance to India is north over the North Pole. Also note that to aim your antenna at Japan you must point it toward Alaska towards the northwest.

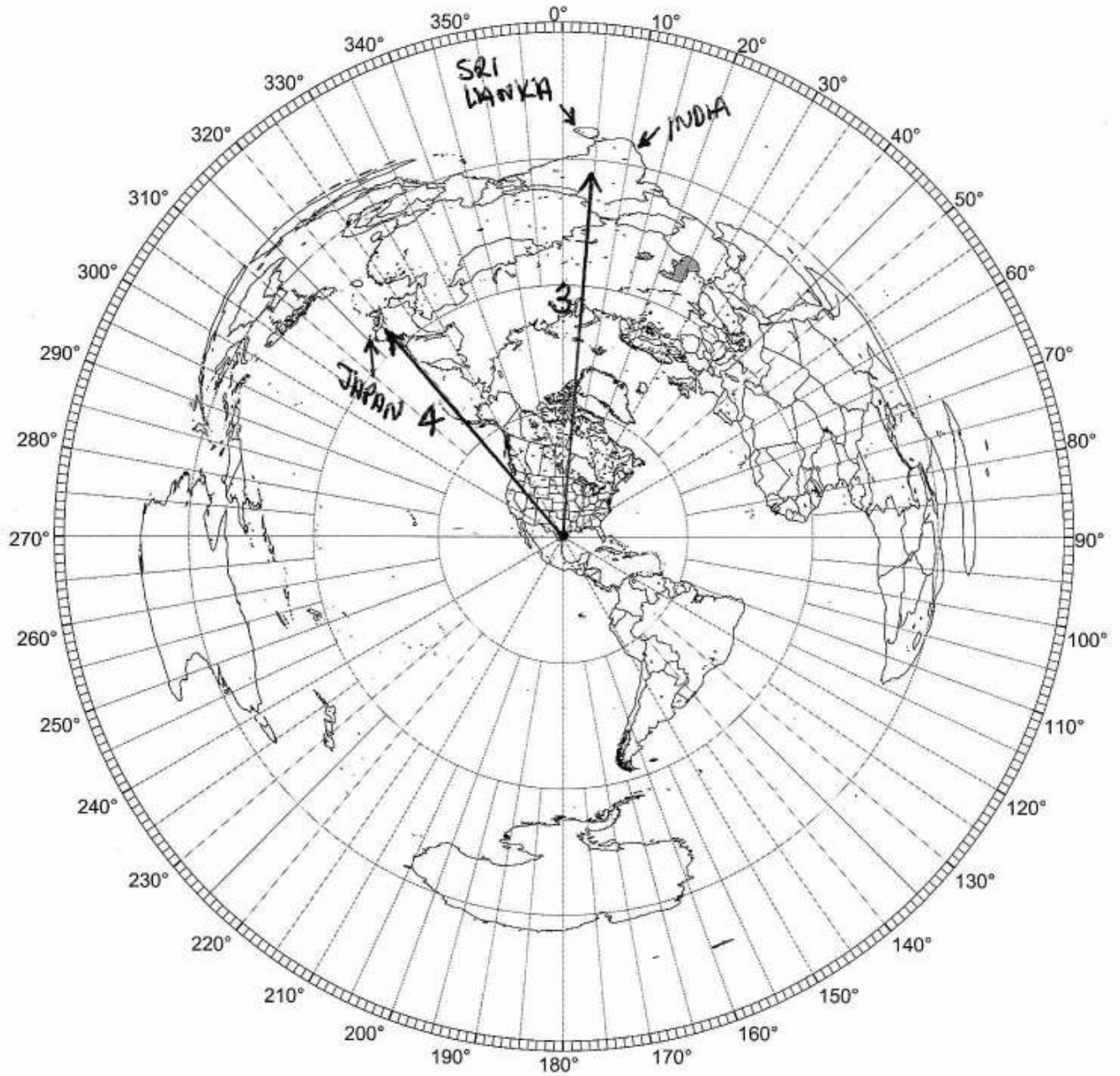
political map of the world, April 2000



Mercator Flat Projection Map

Azimuthal Map

Center: $27^{\circ}36'15''\text{N}$ $97^{\circ}12'29''\text{W}$
Courtesy of Tom (NS6T)



Compass angle and distance are correct.

Communications:

Morse Code

Morse Code is over 100 years old. It was developed for use with telegraph lines and was adapted for wireless radio at the turn of the 20th century. The use of Morse Code has many advantages. It requires very simple equipment, and Morse can be heard much better than voice in poor conditions.

Many hams still use Morse Code. To learn Morse code you should never look at the dots and dashes on a reference sheet. This introduces an additional visual translation which will limit your copy speed. It is best to learn the sound of each letter as it is sent. Then you just have one audio translation to make. You hear the sound and write down the letter. A very good method to learn the code is the Koch method developed about 80 years ago, but is now available as a computer program. See:

<http://www.g4fon.net/CW%20Trainer.htm> .

Since we do not want you learn the characters incorrectly using the visual pictures of the dots and dashes we will not show the code here. What we will do is have the instructor go over the letters that make up your name. Once he has gone over all these letters he will send your name in Morse code.

Listen to the sounds of the letters that make up your name. The instructor will send the characters using a paddle and electronic keyer. These will form the dits and dahs automatically. The left paddle makes the short dit sounds, and the right paddle makes the long dah sounds. If you want to learn the code you need to practice all the letters and numbers and punctuation using the Koch program until you can copy with about 90% accuracy. Then you are ready to get on the air (if you have obtained your ham license).

Voice Communications

Before you can effectively communicate by voice using a radio you need to know a few things first. You must realize that certain words and letters are very similar in sound. On the air a “P” and a “T” are very difficult to distinguish. So you must carefully enunciate each syllable slowly. If the person is writing down what you are saying you must speak very slowly. Also certain words must be spelled out. But in order to be sure that the person hears the correct letter you must use the International Telecommunication Union Phonetic Alphabet (IPA). We have shown the IPA below:

<u>Letter</u>	<u>Word</u>	<u>Pronunciation</u>
A	ALFA	<u>AL-FAH</u>
B	BRAVO	<u>BRAH-VO</u>
C	CHARLIE	<u>CHAR-LEE</u>
D	DELTA	<u>DELL-TAH</u>
E	ECHO	<u>ECK-OH</u>
F	FOXTROT	<u>FOKS-TROT</u>
G	GOLF	GOLF
H	HOTEL	<u>HOH-TELL</u>
I	INDIA	<u>IN-DEE-AH</u>
J	JULIET	<u>JEW-LEE-ETT</u>
K	KILO	<u>KEY-LOH</u>
L	LIMA	<u>LEE-MAH</u>
M	MIKE	MIKE
N	NOVEMBER	<u>NO-VEM</u> BER
O	OSCAR	<u>OSS-CAH</u>
P	PAPA	<u>PAH-PAH</u>
Q	QUEBEC	<u>KEH-BECK</u>
R	ROMEO	<u>ROW-ME-OH</u>
S	SIERRA	<u>SEE-AIR-RAH</u>
T	TANGO	<u>TANG-GO</u>
U	UNIFORM	<u>YOU-NEE-FORM</u> (or <u>OO-NE-FORM</u>)
V	VICTOR	<u>VIK-TAH</u>
W	WHISKEY	<u>WISS-KEY</u>
X	X-RAY	<u>ECKS-RAY</u>
Y	YANKEE	<u>YANG-KEY</u>
Z	ZULU	<u>ZOO-LOO</u>

<u>Number</u>	<u>Pronunciation of Numbers</u>
Ø	<u>ZEE-ROW</u>
1	WUN
2	TOO
3	TREE or <u>THUH-REE</u>
4	<u>FOW-ER</u>
5	<u>FIFE</u> or <u>FY-EV</u>
6	SIX
7	<u>SEV-EN</u>
8	AIT
9	<u>NINE-ER</u>

Making a contact:

- 1) You need to know the call sign of your own station. In this case it is N2CRP or “NOVEMBER-TWO-CHARLIE-ROMEO-PAPA”.
- 2) You need to know the call sign of the station you are calling:
 - a. Write down the call sign here: _____
 - b. Write down the ITU phonetics of the call sign here:

- 3) To call the station you will call either using the standard alphabet or the phonetic alphabet depending on conditions:
 - a. “W2MY this is N5CRP” or
 - b. “Whiskey-Two-Mike-Yankee” this is “November-Five-Charlie-Romeo-Papa”
- 4) When you hear a reply from the other station, give your name. For example:
 - a. This is Fred, “Foxtrot-Romeo-Echo-Delta”, over
 - b. Don’t forget to say the word “over” to tell the other station that you are done with your sentence.
- 5) After the station replies then say:
 - a. “Thank you for the contact. This is N5CRP. Out.”
 - b. Don’t forget to say the word “OUT” to tell the other station that the contact is finished.

Equipment

Generator

This is a special generator that does not emit radio frequency interference. It outputs a pure alternating current. The form of AC that a regular generator outputs makes it unsuitable for powering electronic equipment. It will destroy radios, televisions and computers. Regular generators are designed to run power tools and large appliances such as refrigerators.

Mathematics:

If a contractor generator costs \$500 and outputs 5000 Watts, how expensive is it per Watt? $500/5000=.1$ or Ten cents per Watt.

If a Honda inverter generator costs \$900 and outputs 1600 Watts, how expensive is it per Watt? $900/1600=$ fifty-seven cents per Watt.

The Honda costs $57/10 = 5.7$ times more than the contractor grade generator.

Radios

VHF radios are line of sight. They are good within cities. A repeater can give you about a 60 mile diameter range.

HF radios can work the world.

Antennas

Antenna size depends on the wavelength of the radio wave that is used. A wavelength on 144 MHz VHF is about 2 meters. Our half-wave 144 MHz antenna at the top of the mast is about 3 feet long. Our HF antenna is designed for 3.5 MHz. It is a half wavelength long and is 135 feet long.