Radio Merit Badge Boy Scouts of America



Module 3 – Amateur Radio BSA National Radio Scouting Committee 2012



Class Format



- * Three modules any order
 - * Module 1 Intro To Radio
 - * Module 2 Electronic Components & Safety
 - * Module 3 Amateur Radio & Emergency Communications

Key Topics in This Module

- * 9.a.(1) Why does the FCC have an Amateur Radio Service?
- * 9.a.(1) Amateur Radio Activities
- * 9.a.(2) Logging a Contact
- * 9.a.(3) Q Signals & Abbreviations
- * 9.a.(4) Amateur Radio Licenses
- * 9.a.(5) Emergency Procedures
- * 9.a.(6) Types of Amateur stations
- * 9.a.(6) Repeaters
- * NOAA Weather Radio

Why does the FCC have an Amateur Radio Service?

- Volunteer service (community service and disaster help). A Scout does a good turn daily - here's another way.
- International goodwill A great way to talk to people in far away lands.
- * Experimentation If you want, you can build your own radio equipment, and many hams build their own antennas. Some hams have come up with new inventions, such as FM, SSB, Packet Radio, Automatic Position Reporting Systems.
- * Communication skills Because only one person can talk at a time, you learn how to listen!
- * Self-training You can learn by doing.

What is Amateur Radio?

Voluntary, non-commercial radio service established to:

- * Increase the number of radio and electronics experts
- * Improve international goodwill
- * Assist with emergency communications



* Experiment with radio to improve technology

Amateur Radio Activities 1

* <u>DX</u>

- * Many hams talk to other hams around the world
- * They can collect QSL cards (postcards) to prove they did it. (Collect countries!)
- * It's a great way to have fun and learn about geography.

* <u>Contests</u>

* Held many weekends to contact as many people from a certain place or in a certain way.

* Packet radio

- * Some hams hook computers to radios to send electronic messages.
- * Rather like wireless e-mail.

Amateur Radio Activities 2

* <u>Camping</u>

- ^{*} Communications are easy even in the backcountry
- * Can summon help or report back how things are going.

* "Fox" hunting (Radio Direction Finding)

- Used to locate:
 - * Hidden transmitters
 - * Tagged wildlife
 - * Downed aircraft
 - * Life rafts
 - * Stolen cars

* Jamboree On The Air

* (JOTA) is the third weekend every October when Scouts all over the world talk to each other on ham radio.



Requirement 9 a (1)

Amateur Radio Activities 3

* Public Service

- At parades & special events.
 - From small carnivals all the way to the Tournament of Roses Parade.
- * Ham radio operators are often the best to help with communication at large community events

* <u>Disasters</u>

- * Hams are often called on to help during fires, floods, earthquakes, and other disasters.
- * At these times, telephone lines and cell phone sites are often damaged or overloaded,
- * Ham radio is the only reliable communication.

* <u>Skywarn</u>

National Weather Service uses Hams to report severe weather .



Amateur Radio & Emergency Communications

Cell Phones In The Wilderness

From the BSA Field Book, page 78...

"Likewise, wireless telephones can be a convenient means for groups to contact emergency response personnel, but phones are useless if they malfunction, the batteries are exhausted, or distance and terrain prevent clear reception of signals.

Frivolous use of wireless phones can seriously diminish solitude, independence, and challenge in the outdoors. If you carry a portable telephone, stow it deep in your pack and bring it out only for emergency calls."



Cell Phones In The Wilderness



Emergency preparedness tool

- * Keep packed away and turned off
- * Carry extra battery
- * **Respect serenity of outdoors**
- * Just because Scoutmaster has one doesn't mean YOU'RE prepared!



GPS receivers and wireless phones are sometimes useful during outdoor emergencies.

Cell Phones In The Wilderness

Other Items to Consider

SUBVIVAL

Many people consider a cell phone an essential piece of equipment for outdoor activities. Knowing how a cell phone operatesespecially yours-can help make the most of its potential. from your set to call 911 from your cell phone in the backn you were to can six nom your eer prone in ore oace, country, your call for assistance would be picked up by the near-

WILDERNESS

est cellular tower in the most direct line of sight to your location. In might be sent to a county 911 center, a state police dispatch. or, in some areas, even to the Canadian authorities. These callor, in some areas, even to use canautan autornites, mese can answering centers probably would be outside the boundaries of your area and the personnel would have no way of knowing where you were calling from unless you could tell them. For this reason, it's often a good idea to know the actual hore number of the emergency responders serving the area.

This could be forest rangers, deputy sheriffs, or a variety of other professionals. Be prepared to give complete information where processionans, we prepare to give compare manimany about your location and the nature of the emergency when auvan your avanuut ains une nature or the energency writen placing a call for help; you might be able to make only one call. If you take your cell phone along on a wilderness outing, be

- · Leave with a fresh, fully charged battery.
- · Carry at least one extra, charged battery with you. Keep batteries warm for extra-long use. Show everyone in your group how to use your phone, and
- be sure that they know where it is kept. Know how to increase your phone's signal strength by pointnow now to increase your prane is signed surveying or pane-ing the antenna up, moving to a clearing, gaining elevation, ing use amenus up, invents w a cleaning, saming corrange, and turning your body (you might be obstructing the signal).

- Use 911 only in case of an actual emergency. If you are unsure ou are in the midst of a real emergency, try to

Wilderness Survival Merit Badge Book, p 15

From the chapter entitled *"Avoiding the Outdoor"* Emergency"...

"Know how to increase your phone's signal strength by pointing the antenna up, moving into a clearing, gaining elevation, and turning your body (you might be obstructing the signal)...cell phones should *never* replace preparedness."

Cellular During a Disaster



Last Updated: Thursday, 7 July, 2005, 11:36 GMT 12:36 UK

London mobile networks jammed Mobile phone networks in London have been overwhelmed following the blasts in London.

Networks were running at near capacity as those caught up in the chaos called family and friends.

32 GRANNY IMAGES

There were several blasts across

calls being made meant that many people had trouble getting The surge in the number of through first time.

Vodafone said it had reserved some network capacity for the emergency service workers dealing with the disaster.

Weakness

During widespread emergency, Such as 9-11 or the 2005 London train bombings, cell systems busy out and become unusable.



Emergency Communications

Oregon Hams of all Ages Respond to Devastating Windstorm

Among the 60 or so local hams who responded to a December windstorm that had peak gusts of 147 mph two young men stood out as heroes. They convinced their parents to deliver them, early in the storm's heavy wind, to the Seaside Fire Department where they took up positions ready to pass all communications from the Fire Department to the County EOC. Nick, KE7NIT, and his friend Tommy, KE7OUD, both 12 years old, ran out in the wind and rain to find the best spot to reach the County EOC on their handhelds. They both passed messages, and provided help to Senior Citizens at the nearby Chisolm Senior Center.



In Seaside, Oregon, Nick, KE7NIT, provides communications support with Tommy, KE7OUD, monitoring.

Both boys are members of the newly formed STARS (Seaside Tsunami Amateur Radio Society, WA7VE) in Seaside. — *Hal J. Denison, WA7FIV*

QST, April 2008, p 13

Athens Amateur Radio Club, Inc.

Sending Out An Emergency Call - Voice

- * You may use *any radio* at *any time* to get help during an emergency
- * "Break Break" followed by your call sign to interrupt a radio conversation in progress
- * "Mayday Mayday Mayday" followed by your call sign to call on a clear frequency



Emergency Radio Calls

- "MAYDAY" is the international word for requesting help by radio.
 - * In the US, **"EMERGENCY**" works too.
 - * In Morse code, send **SOS** "(... ___ ...) slowly.

* Speak clearly and give complete information

- * Similar to a 911 telephone call.
- * Give detailed location of the emergency
- * The person helping you on the radio may be in another state or even in another country!

* Just because you have a radio doesn't mean someone will be able to hear you.

- * You might have to climb higher up a hill.
- * FRS radios and cell phones have less power than ham radios.

Technology In The Wilderness

From the BSA Field Book, page 436...

"Many SAR teams use ham radio technology, especially the <u>two-meter band</u> and the FCC <u>Technician license</u>, to facilitate communications."

Log Book Essentials

- * Contact's Name
- * Contact's Call
- * Contact's QTH (location)
- * Frequency
- * Mode
- * RST Sent (signal report)
- * RST Received (signal report)
- * Comments



Q Signals and Amateur Terms

QRM	Man-made interference	QRN	Natural noise or interference
QRP	Low Power (< five watts)	QRS	Slow down Morse code speed
QRT	Quitting - off the air	QSB	Signal is fading
QSL	Acknowledge receipt (card)	QSO	Conversation ("cue-so")
QSY	Change frequency	QTH	Location (think H for Home)

Log	Record of QSOs	CW	Morse code (means Continuous Wave)
DX	Distant (foreign stations)	CQ	Calling any station ("seek you")
ОМ	Old man (male ham)	YL	Young lady (female ham)
Rig	Radio	Shack	Room the radio is in
HI	Laugh in Morse code	73, 88	Best regards, love and kisses

Licensing

- * License required to *transmit*, but not to receive
- * Tests given by volunteer examiners
- * No age limit
- * No distance limit



Amateur Radio License Classes

* <u>Technician Class</u>

- * Starter license
- * Simple 35 question multiple-choice written test
- * All privileges above 30 MHz (VHF, UHF)
- * Mostly line-of-sight (but includes repeaters and satellites)

* General Class

- * Standard license
- * Additional 35 question multiple-choice test
- * Adds HF (long distance)

* Extra Class

- * Highest class of license
- * Detailed 50 question Radio Theory Test
- * A few more HF frequencies
- * Short Call Sign

Technician Class License

* Entry level license.

- * 35 question multiple choice test
 - * Theory, rules, & procedures
- * Full VHF & UHF use
 - * communicate around town and use repeaters,
 - * cannot use some of the HF bands which are used for world-wide contacts.
- * This merit badge covers about half of the license test!
- * Books list all possible questions and answers.
- * Practice tests can be found at:
 - * QRZ web page <u>WWW.QRZ.COM</u>

Who Administers Amateur Radio Exams?

- * Hams called "Volunteer Examiners" administer the exams for the FCC.
- * Exam sessions and free study classes are run by local radio clubs such as:
 - The Warminster Amateur Radio Club
 - * www.k3dn.org
 - * The Delaware Valley Radio Association
 - * www.w2zq.com
- * Lots of other information on ham radio can be found at the ARRL web page:
 - * www.arrl.org

Ham Radio Station Types

- * Handheld Transceivers (HT): Small, light, portable, but not much power. Some can fit in your pocket. Using repeaters, they can be quite useful, and they can go on your hike easily.
- * **Base Station Transceivers**: Permanent station in a building. More power, easier to use, more features.
- * Mobile Transceivers : Permanent station in a vehicle. More power. That HT antenna doesn't work well inside a metal car.
- * <u>Repeaters</u>: Located on high points (Mountains, tall buildings, satellites) to automatically relay signals. Some have connections to the telephone system or the internet.
- * Which kind of radio is best? It depends on what you want to do. You wouldn't backpack with a heavy base station radio, but that base station radio will let you talk farther when you are at home.

Portable Operation



- Camp
- •Field Day
- •Emergency Drill

Fixed operation at a location other than your normal home station.



Types of Radios - Handhelds

•<u>Bands</u> – VHF / UHF

•<u>Power</u> – Up to 5 watts

•<u>Range</u> – 1 to 5 miles without repeater, much more with repeater

•<u>Price</u> – \$100 to \$350

Single Band or Dual Band

Base Station Operation



Types of Radios – Base Station



- •<u>Bands</u> HF (Sometimes VHF / UHF also)
- •<u>Power</u> Usually 100 watts
- •<u>Range</u> Worldwide
- •<u>Price</u> \$700 to \$10,000



Two-Way Radio

More examples of radios that both transmit and

receive (two-way)

- * Police / fire
- * Utilities
- * Businesses
- * WiFi
- * Cellular



Mobile Operation







The ability to operate while in motion

Types of Radios – Mobiles



Single Band

- •<u>Bands</u> VHF / UHF
- •<u>Power</u> Up to 50 watts

•<u>Range</u> – 5 to 10 miles without repeater, much more with repeater

•<u>Price</u> – \$150 to \$500





Family Radio Service (FRS)

FRS is a radio service in the UHF band for use by the general public.

- * 14 channels $\frac{1}{2}$ watt of output power
- * Range limited to couple of miles line-of-sight
- * No license required

General Mobile Radio Service (GMRS)

- * 22 channels higher output power
- * Range up to 10 miles, line of sight
- * License required



FRS + GPS = Garmin Rino

- GPS receiver for determining your location
- FRS radio for voice communications
- Map showing your location and your buddy's location
- Radio sends out periodic location data burst on voice channel
- Cost \$250 to \$400 depending on features



Get On The Air For Free With Echolink

Free software lets you link into distant repeater towers over an internet connection

Only a computer, headset and internet connection required.

This is called VoIP communications

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www.Echolink.org

Get On The Air For Free With Echolink



Repeaters

- * Receive on one frequency and transmit on another.
- * Usually in the VHF and UHF bands
- * Allow much longer range for small radios.
- * Located on mountains, towers, buildings and in space.



Requirement 9 a (6)

NOAA Weather Radio

- * Continuous Weather Forecasts & Warnings
- * 162.55, 162.475, 162.40, 162.45, 162.50 MHz
- * Essential for boating, hiking and camping.
- * Most Ham radios can also receive this.
- * Special SAME (Specific Area Alert Encoding) receivers actually turn themselves on when a warning is sent for your county!