“When all else fails, Amateur radio works!”

Dave Cook, WAØTTN
MIRO Volunteer Chairman
Agenda

- What is Amateur Radio?
- How does it support Emergency Operations?
- What is MIRO?
- How can I become a Ham?
Ham Radio History

- Radio technology has been around for over 100 years
- Amateur radio operators have been involved, and innovating, from the very beginning
- “Amateur” has the same connotation as “amateur athlete”, meaning we cannot accept payment for our services
- There are numerous opinions on where the term “Ham” originated – but it’s not an acronym
- Ham operators have always been involved in global and local disaster aid with wireless communications
- Communications skills were incorporated from professional telegraphy and military communications training
Amateur radio is a “hobby with a purpose” - a valuable asset during times of emergency when traditional communication systems break down.

Mandated by the Federal Communications Commission, one of the key purposes of Amateur Radio is to provide a “voluntary noncommercial communication service” to assist public safety agencies in the event of a disaster or as required. (47 CFR 97.1(a); 97.401(a)).
Ham Radio in Public Service

- Most public service communications today are heavily reliant upon land-line telephone, cellular telephone, and fax systems to conduct routine operations. In disasters such as earthquakes (or even power-outages), these systems fail.
- Subsequently, police, fire, and other public service radio with limited number of channels become rapidly saturated.
- Ham operators provide such agencies with a back-up radio communications system with wide spectrums of radio frequencies and communications expertise.
- Ham operators can also transfer computer data, such as e-mail and data files, digitally over radio ("packet radio")
Ham Radio in Public Service

- Unlike commercial communications, ham radio is self-sufficient in times of disaster
  - Many hams maintain generator and/or battery backup power in their homes
  - Many hams have mobile systems in their automobiles
  - “Field Day” is an annual event to practice setting up and operating in a foreign location
- Through coordination and regular “drills” with county, state, and national ham organizations, we can provide communications for, and route messages between, any government or disaster relief agency
OPERATION: FIELD DAY

Mercer Island Radio Operators (MÍRO)
Ham Radio Activities

- Ham radio is **NOT**:  
  - Broadcasting  
  - Amateur radio uses two-way communications  
  - Ham operators cannot receive payment for services  
- CB  
  - Citizens’ Band is non-licensed, limited radio service  
  - CB operates on in a narrow band of frequencies at 27 megahertz, with limited power (5 watts), and limited propagation  
- FRS/GMRS  
  - Very low power UHF (line of sight) “walkie-talkies”  
  - GMRS can use up to 2 watts, but license + fee is required
Terminology

- **MF – Medium Frequency**
  - The AM radio band is in this region
  - 300 kilohertz to 3 megahertz
  - Short distance during the day, long distances at night

- **HF – High Frequency**
  - Known traditionally as “shortwave”
  - 3 megahertz to 30 megahertz
  - Long distances most of the time, depending on time of day and region of the spectrum
Terminology

- **VHF – Very High Frequency**
  - 30 megahertz to 300 megahertz
  - Where TV channels 2 through 13 used to be broadcast
  - Mostly line of sight

- **UHF – Ultra High Frequency**
  - 300 megahertz to 3 gigahertz
  - The UHF TV band, and where digital TV is broadcast now
  - Strictly line of sight
RF Spectrum
Capabilities

- **Local**
  - City – VHF/UHF Repeaters and simplex
  - County – VHF/UHF Repeaters
  - State – VHF/UHF Repeaters and HF
- **Nationwide** – HF (shortwave)
- **Global** – HF
- **Satellite** – Not practical for emergency communications due to orbital paths
Typical Coverage

<table>
<thead>
<tr>
<th>RF Region</th>
<th>Typical Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHF/UHF point-to-point</td>
<td>Approx 5 miles, depending on terrain</td>
</tr>
<tr>
<td>VHF/UHF with a repeater</td>
<td>50 to 200 miles, depending on repeater site and local terrain</td>
</tr>
<tr>
<td>HF – 160, 80 meters</td>
<td>State-wide</td>
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<tr>
<td>HF – 40 meters</td>
<td>Nation-wide</td>
</tr>
<tr>
<td>HF – 20 meters</td>
<td>World-wide</td>
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</table>
Modes

- Morse Code – Yes, we still use it!
- Telephony – AM, SSB, FM
- Analog – Slow-scan TV (SSTV), fast-scan (standard) TV
- Digital – Radio teletype (RTTY), Packet radio, Winlink, PSK31, and many others
- Bandwidth, Power, and Propagation Conditions all factor in to which mode is used
Power

- Ham operators are allowed to use up to 1,500 watts of power on most bands.
- VHF/UHF Handheld radios are typically 5 watts, just to get to a repeater.
- VHF/UHF Repeaters are typically 50 watts, which is sufficient for long distances because they are located on high ground.
- HF (shortwave) voice operation generally uses the maximum power level for long distance communication.
- However, digital modes such as RTTY, PSK31, and Morse code can be used globally at low power (50 watts) because of their narrow bandwidth.
Propagation

- Local – VHF/UHF are generally “line of sight”
- Shortwave – Ionosphere refraction allows for extraordinary distances
- Antenna height and terrain clearance are key factors for transmission and reception on any of the frequency bands
Radio Wave Transmission

- UHF radios are “line of sight” – terrain and even trees can block radio signals
- MIRO has repeaters for both VHF and UHF, but can also use point-to-point communications.
- In areas of rough terrain, hams can use HF (shortwave) which is reflected by the ionosphere, allowing for communications anywhere
Repeater Systems
<table>
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<tr>
<th>TEAM</th>
<th>REPEATER 1</th>
<th>REPEATER 2</th>
<th>REPEATER 3</th>
<th>SMP 1</th>
<th>SMP 2</th>
<th>SMP 3</th>
<th>SMP 4</th>
<th>SMP 5</th>
<th>PACKET</th>
<th>PACKET Node/WL</th>
<th>Primary Email</th>
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<tr>
<td>King County ARES</td>
<td>147.300</td>
<td>147.325</td>
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<td><a href="mailto:W7TE@winlink.org">W7TE@winlink.org</a></td>
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<td>Median: <a href="mailto:K8V73@winlink.org">K8V73@winlink.org</a></td>
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<td><a href="mailto:W7W1F@winlink.org">W7W1F@winlink.org</a></td>
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**Fire Zone 3 (South)***

- Auburn
- Black Diamond
- Buckley
- Enumclaw
- Federal Way
- Kent
- Maple Valley
- Renton
- Sea-Tac
- Tukwila
- Valley Center
- Vashon Island
- White Center

**Fire Zone 4 (Southwest)**

- West Seattle

**Fire Zone 5 (Seattle ACS)**

- NorthEast

**Fire Zone 6 (Seattle ACS)**

- Central

**Medical Services**

- King County Public Health

**Specialized Teams**

- Salvation Army (SATERN)

**Other Communications**

- 911 Communications

*Note: All frequencies are in MHz.*
HF Operations

- State ARES/RACES Operations – Camp Murray
- EOC to EOC exercises are run on every month that has a “5th Saturday”
- Purpose is to test communications between EOC ham communicators and state facilities
- Many EOCs run on emergency power and even mobile
- Cross band HF coordination (liaison) between VHF/UHF systems at the EOCs
Message Handling

- Procedures have been developed over many years
  - National Traffic System (NTS)
  - American Radio Relay League (ARRL)
  - Amateur Radio Emergency Service (ARES)
  - Radio Amateur Civil Emergency Service (RACES)
  - Military Affiliate Radio Service (MARS)
- Goal is accuracy and efficiency
- Discipline is key
- Regular practice through drills and exercises
Protocol and Discipline

- Hours and hours of boredom interspersed with moments of sheer panic
- Initially, everyone is in panic mode – net control must organize and prioritize messages
- Phase 1 – Check ins and message traffic priorities for queuing
- Phase 2 – High priority message handling
- Phase 3 – Low priority message handling
- Phase 4 – Maintain the net and discipline

Mercer Island Radio Operators (MIRO)
Channel Operation

- City-provided UHF radios have a single channel, or limited number of channels
- UHF radios will be used when possible, but because they will bottleneck easily, hams provide the “wideband” message communications
- This is not to say that the UHF radios won’t be useful, but rather to set your expectations
- A back-off strategy must be followed when channel saturation occurs
**Alternate Communications**

- Hams have a virtual infinite number of communications channels for “off net” traffic handling.
- This results in a much higher effective bandwidth and much less prone to channel saturation.
- MIRO hams are assigned to field teams (Fire, Police, EMAC, etc.) as needed when conventional communication is saturated or ineffective.
Effective Communications

Ham communications procedures don’t apply to traditional municipal radio systems because we have frequency agility. However, here are some general recommendations:

- Be patient – there is only one dispatcher and many of you
- Don’t “double” – it only blocks both you and the other sender so that nobody gets through
- Be brief – don’t “hog” the channel
About MIRO

- Formed in 1993 by a group of amateur radio operators
- Sponsored by the city to provide additional radio communications capabilities during emergencies when traditional services are overloaded or unavailable
- We are a “sponsored organization” not a “ham radio club”
- Currently sponsored by the Mercer Island Department of Emergency Preparedness – Officer Jennifer Franklin
- We provide voice and data communications services to neighboring ham radio operators and groups through our facilities at the water reservoir
MIRO Facilities

- VHF and UHF repeaters at the water reservoir with generator backup power
- Radio room in City Hall across the hall from the EOC
- Radio room at CCMV to provide shelter communications and coordination with EOC
- Radio equipment at both North and South fire stations
- Redundant Winlink (e-mail via radio) nodes at the water reservoir and north end of the island
EOC Radio Room

Mercer Island Radio Operators (MIRO)
MIRO Membership

- There are currently approximately 150 licensed amateur radio operators on Mercer Island
- MIRO currently has 49 active members
- Of these, we expect 15 to 20 might be available for callout in an emergency
- Of these, 3-4 would be at the EOC (City Hall), 1-2 would be at CCMV (shelter), and the rest would be available for deployment in their assigned regions
Region Assignments

- Six region assignments
- MIRO members are expected to work within their regions, unless directed for specific duties elsewhere

Mercer Island Radio Operators (MIRO)
Mercer Island Radio Operators

そうで、あなたも免許を取得できるかもしれません！

Visit our web site for more info: www.mirohams.org

“ROTFLMAO”
Golly, it must be an Emergency Message!
Ham Licensing

- Required by the FCC to operate ham equipment
- Grades:
  - Technician – Can use high end of HF, and VHF/UHF
  - General – Can use most of HF bands
  - Extra – Can use all frequencies
- Morse code is no longer a requirement
- Written tests knowledge of:
  - Rules and regulations
  - Operating practices and procedures
  - Radio and electronics fundamentals
Further Information

- MIRO Web site – [www.mirohams.org](http://www.mirohams.org)
  - Click the “Ham Radio Information” link for links to other resources on the Internet
- ARRL Web site – [www.arrl.org](http://www.arrl.org)
  - More information on how to become a ham
Field Day Operations

- June 25th and 26th, 2011
- Rotary Park (next to the Library)
Summer Celebration

Mercer Island Radio Operators (MIRO)