

# Developing a Limited Rover Station

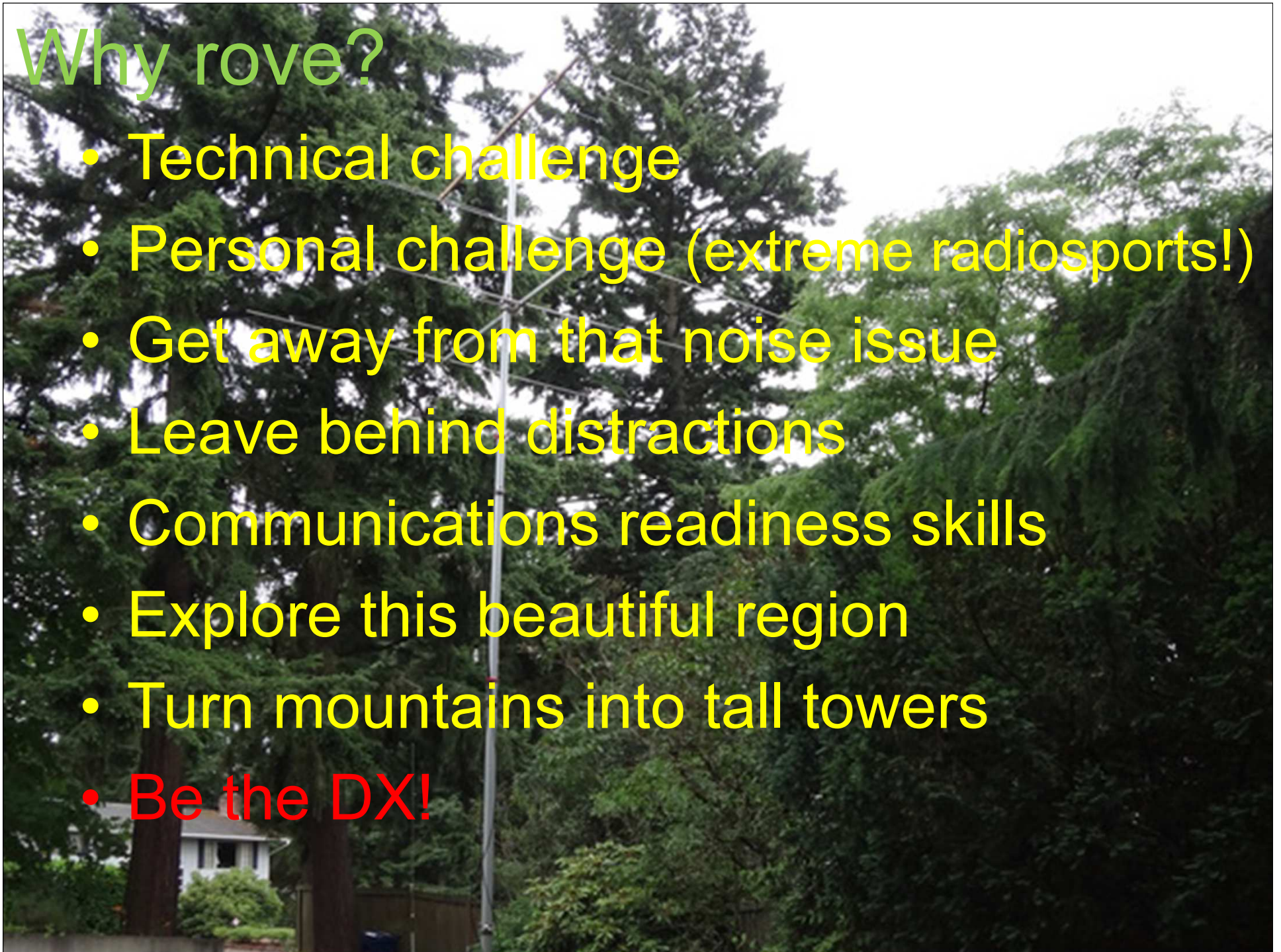
Darryl Holman  
WW7D





# Why rove?

- Technical challenge
- Personal challenge (extreme radiosports!)
- Get away from that noise issue
- Leave behind distractions
- Communications readiness skills
- Explore this beautiful region
- Turn mountains into tall towers
- Be the DX!





# Many grids will *only* be activated by rover



Rod, WE7X, and Barry, WA7KVC, (now K7BWH)  
Olympic Peninsula rove  
ARRL January 2012 VHF Contest

KØMHC/R & W0JT/R  
"The Texas Hill Country  
Rovers"  
January 2013 VHF contest

Developing a Limited Rover Station

PNWVHFS 2014 Conference



# The **Limited Rover** (ARRL contests):

Entry-level rover class (cheaper, simpler)

Bottom 4 band only:

- VHF: 6m, 2m, 222 MHz, 432 MHz
- UHF: 222 MHz, 432 MHz, 902 MHz, 1296 MHz

Limited power:

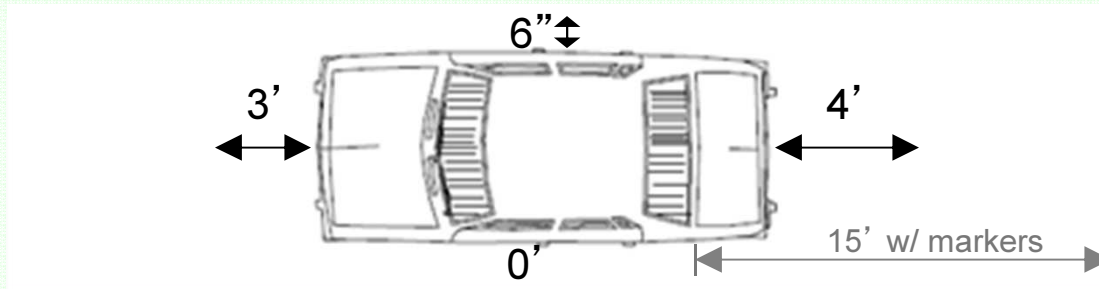
- 200 watts: 6m, 2m
- 100 watts: 222 MHz, 432 MHz
- 50 watts: 902 MHz, 1296 MHz





# Limited Rover as The Great Equalizer

- Limited station complexity (4 bands with good equipment availability)
- Limited antenna complexity
  - While “in motion,” antennas limited by highway height and vehicle overhang laws



- Stationary antennas are limited by set-up time, size and weight
- **Result: a modest station CAN be competitive**

# Roving Contests

- ARRL January VHF
- Spring VHF+ Sprints (5 different dates)
- ARRL June VHF
- CQ WW VHF (July, *6m + 2m only*)
- ARRL August UHF
- Fall VHF+ Sprints (5 different dates)\*
- ARRL September VHF

\*Microwave sprint (903 MHz and above) is next weekend

# Roving Contests

- ARRL January VHF
- Spring VHF+ Sprints (5 different dates)
- ARRL June VHF
- CQ WW VHF (July, *6m + 2m only*)
- ARRL August UHF
- Fall VHF+ Sprints (5 different dates)\*
- ARRL September VHF

\*Microwave sprint (903 MHz and above) is next weekend

# Roving Contests

- ARRL January VHF
- Spring VHF+ Sprints (5 different dates)
- ARRL June VHF
- CQ WW VHF (July, *6m + 2m only*)
- ARRL August UHF
- Fall VHF+ Sprints (5 different dates)\*
- ARRL September VHF

\*Microwave sprint (903 MHz and above) is next weekend

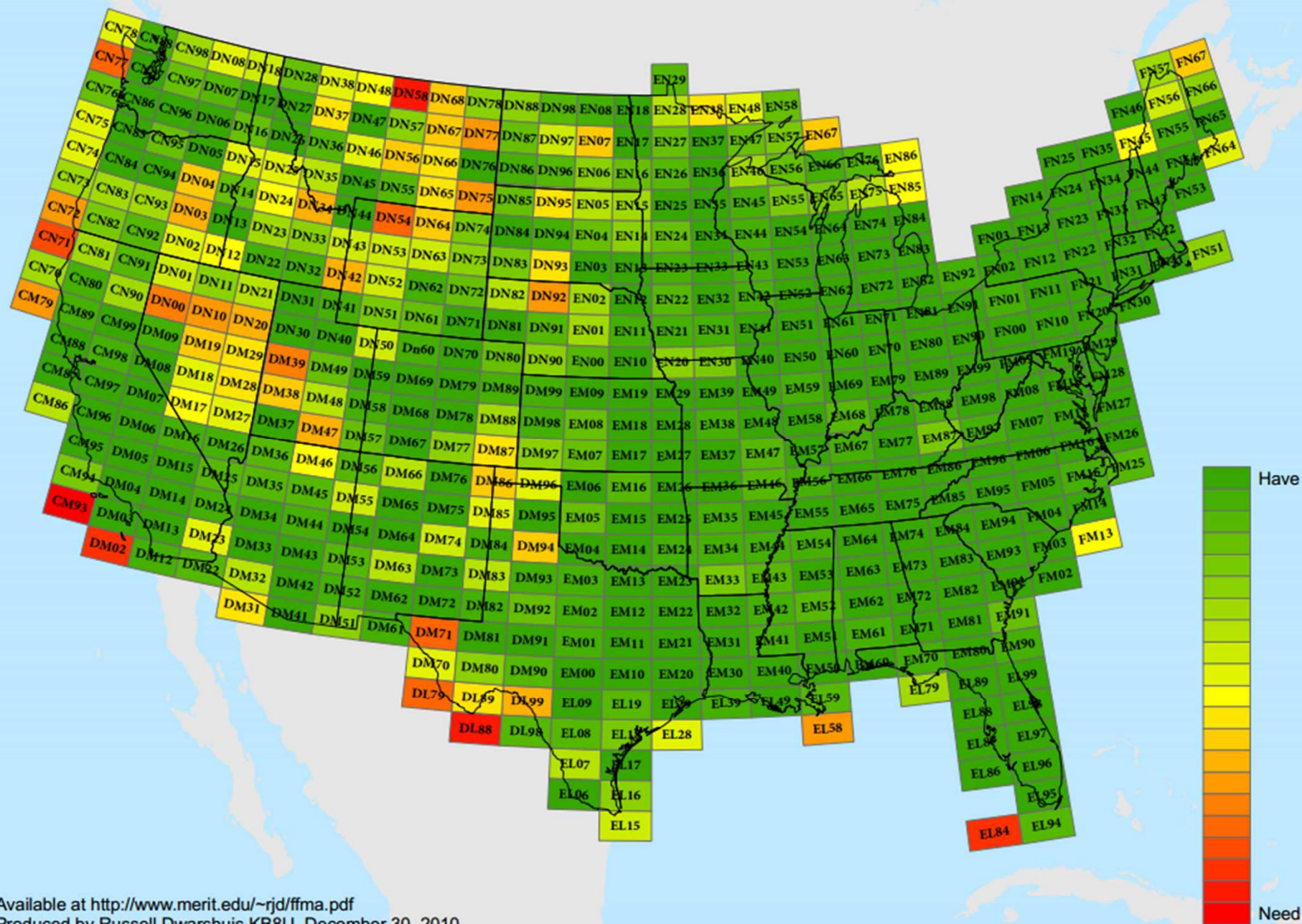


# Roving Contests

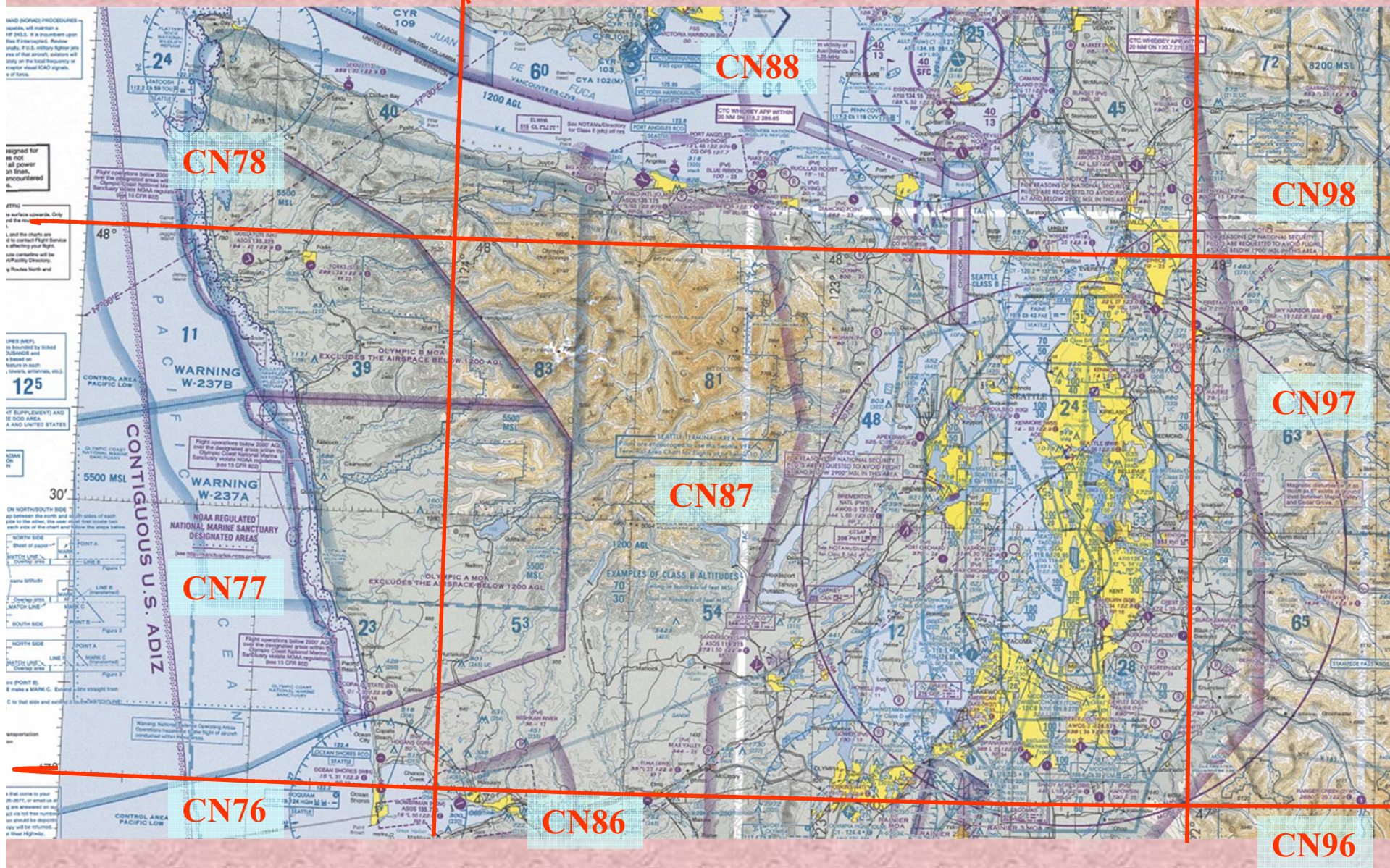
- ARRL January VHF
- Spring VHF+ Sprints (5 different dates)
- ARRL June VHF
- CQ WW VHF (July, *6m + 2m only*)
- ARRL August UHF
- Fall VHF+ Sprints (5 different dates)\*
- ARRL September VHF

\*Microwave sprint (903 MHz and above) is next weekend

# Fred Fish Memorial Award Most Wanted Grids







Developing a Limited Rover Station

PNVVHFS 2014 Conference









CN77



CN76

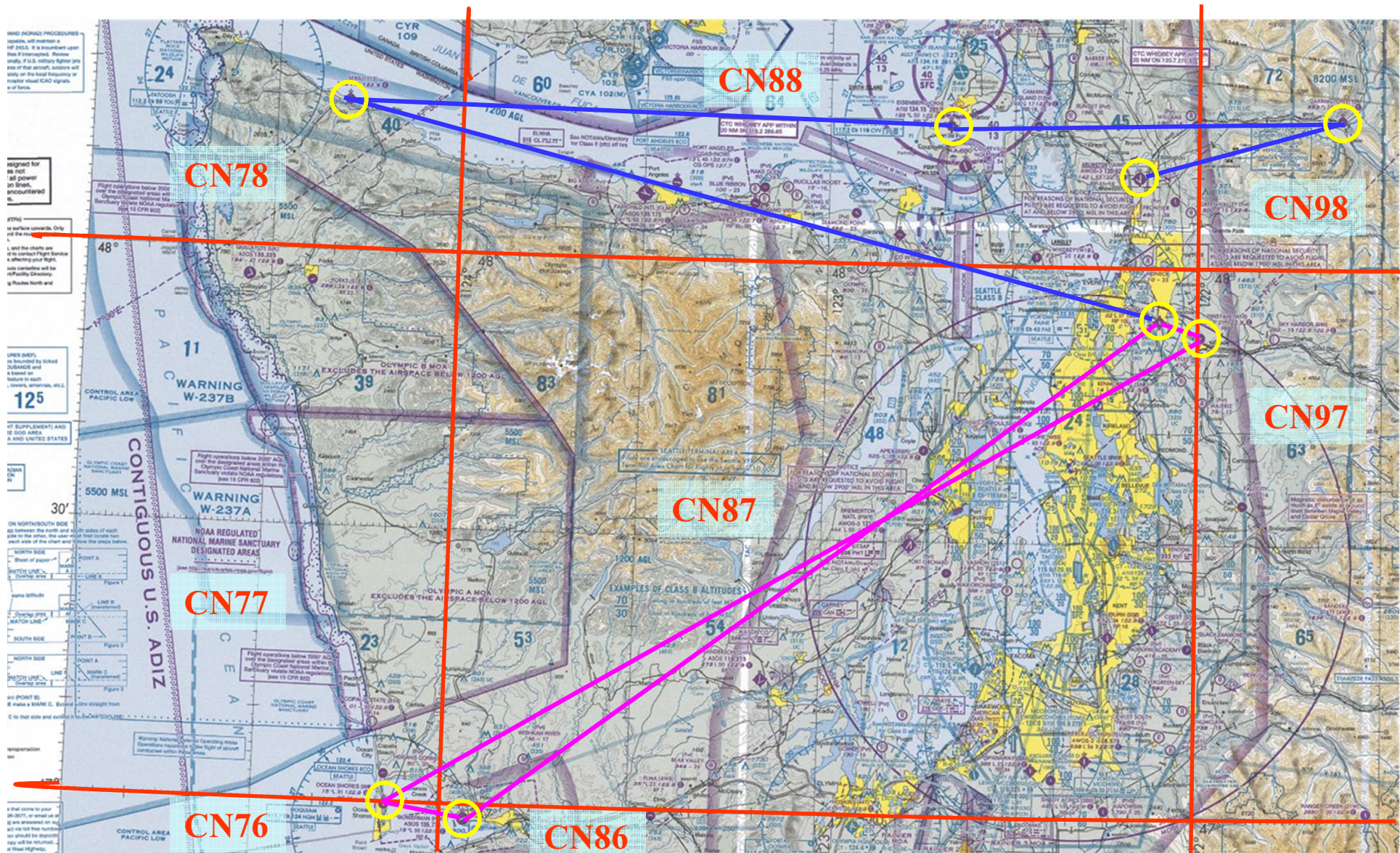
Developing a Limited Rover Station

PNWVHFS 2014 Conference



# 2011 June ARRL VHF Contest route

Day 1 (—) and Day 2 (—)







Developing a Limited Rover Station



PNWVHFS 2014 Conference

Car rover was a modified version of the aero-rover



Developing a Limited Rover Station









Developing a Limited Rover Station



PNWVHFS 2014 Conference



## 2011 ARRL September VHF Contest

- 4 band limited rover
- Pair of stacked 11 element quagis for 432 MHz
- More distant grids



Developing a Limited Rover Station



PNWVHFS 2014 Conference

# 2011 ARRL September VHF Contest



Gusty Winds!

Mast toppled on a gravel road...not too much damage.







2012 ARRL January VHF Contest

Goal: Develop a more specialized car rover





## 2012 ARRL June VHF Contest

- Added amplifiers
- Added Kenwood TS-480 for 6m
- Added an N8XJK Super Booster
- Added an K1EL WinKeyer
- Packaged everything in a rack

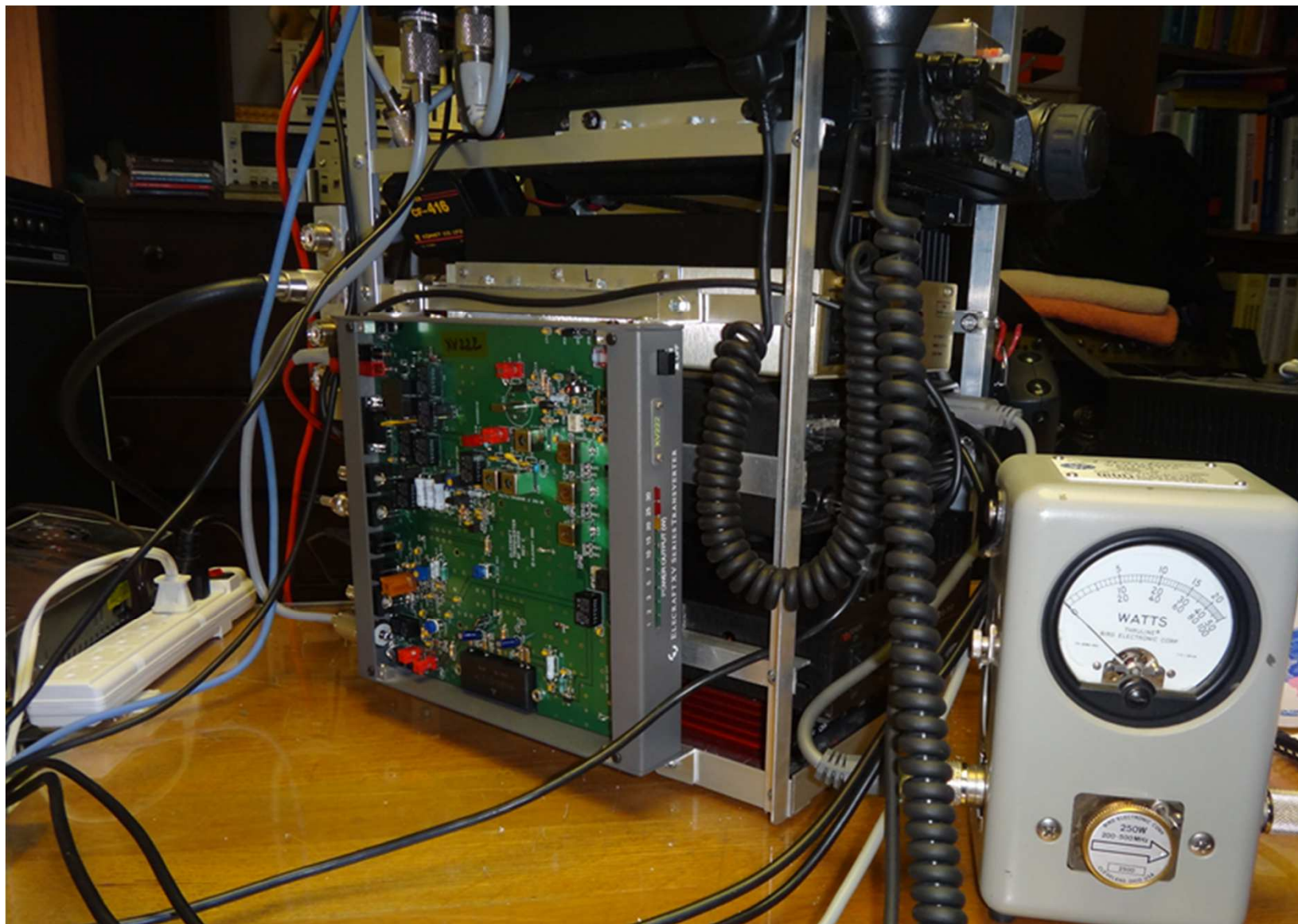


PNWVHFS 2014 Conference



2012 ARRL September VHF contest

New: 20 watt Elecraft XV222 transverter for 222 MHz



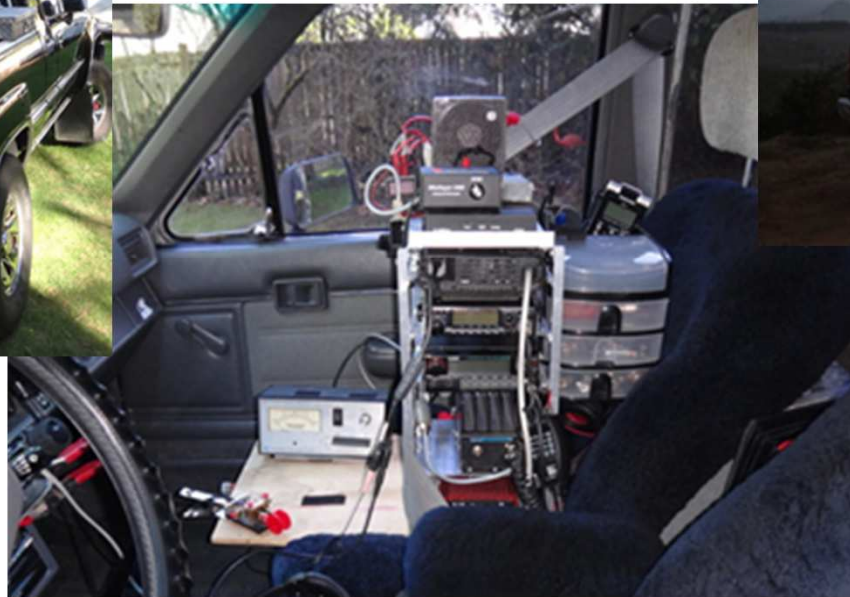
Developing a Limited Rover Station

PNWVHFS 2014 Conference



## 2013 Spring VHF Sprints:

- New truck (1988 Toyota 4WD)



Developing a Limited Rover Station

PNWVHFS 2014 Conference

## 2013 ARRL June VHF Contest:

- Front rotor added for use in motion (antennas < 3' from bumper)







Developing a Limited Rover Station

PNWVHFS 2014 Conference



# August 2013 ARRL UHF Contest Finally...all 4 bands!



PNWVHFS 2014 Conference



# Building a limited rover station



# Assembling a limited rover station

Minimal station: A single all mode rig with  
6m, 2m, 432 MHz rig



ICOM IC-7000



Yaesu FT-100



Yaesu FT-857



ICOM IC-7100



ICOM IC-706mkii



Kenwood TS-2000(X)



## The next step: Add 222 Mhz FM (yes...FM)



Jetstream JT-220M (~\$200)



TYT TH-9000 (~\$180)



Alinco DR-235TMKIII (~\$250)

Adding 222 MHz FM to my rover added more points per dollar than any other single investment!

Alternatively (or additionally):

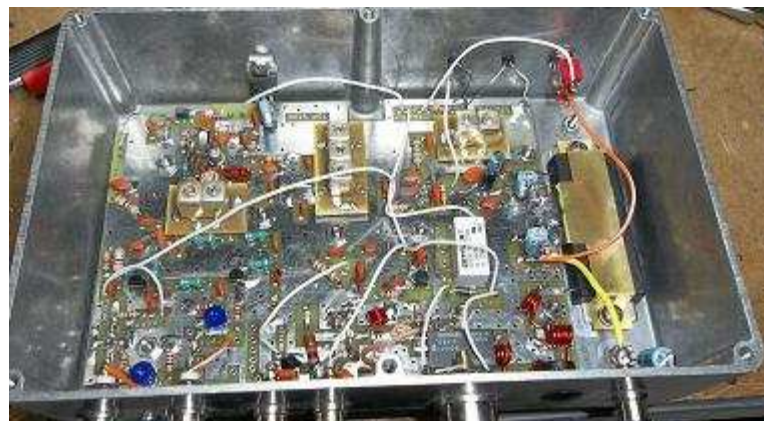
Add a 222 Mhz Transverter (for SSB & CW)



Elecraft XV-222 kit (\$400)



Developing a Limited Rover Station



Down East Microwave L222-28CK kit (\$380)



PNWVHFS 2014 Conference



## Bricks:

### Typically:

- 160-170 watts for 6m and 2m
- 100 watts on 222 MHz and 432 MHz
- Used from \$150 to \$250 each



TE Systems 0510G, 6m  
10 w in, 170 w out



RF Concepts rfc4-110, 432 MHz  
10 w in, 100 w out



Mirage B3016, 2m  
30 w in, 160 w out

## Next Step:

Add dedicated 6m, 2m and 440 FM rigs

### My experience in the Pacific Northwest:

- 6m FM is *NOT* currently worth doing (but used rigs are inexpensive)



Alinco DR-06T, 6m

- ✓ 2m FM has produced modest additional QSOs
- ✓ 440 MHz FM has resulted in some extra QSOs



Alinco DR-600, 2m + 440 MHz



# 902 MHz & 1296 MHz for the UHF contest (and sprints)

- SSB/CW: Transverters (\$200+)



Microwave Modules 1296 MHz transverter



SSB Electronic LT 33 S, 902 MHz

SG-Lab 1296 MHz Transverter



Developing a Limited Rover Station

PNWVHFS 2014 Conference

# 902 MHz & 1296 MHz for the UHF contest (and sprints)

- 902 MHz FM: Commercial equipment Motorola, GE, Kenwood (927.5 MHz or, if possible, 903.2 MHz).



Kenwood TK-981 commercial radio easily programmed for 927.5 MHz FM, ~\$130



Motorola Spectra

- 1296 MHz FM: ham rigs (use 1296.2 MHz)



ICOM IC-1201



Alinco DJ-G7 tribander with 1296 MHz



Alinco DJ-G29T (902 Mhz + 222 MHz)



# Rig accessories

- Keyer



K1EL Winkeyer

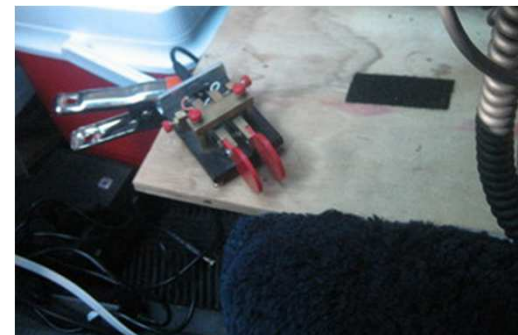


HamGadgets MK-1

- Paddle
- Headsets
- Microphone switch?
- Audio mixer?



W5JH portable paddle



Mini Touch Paddle



LDG SLS-2 RJ-45 Mic switch



## Tip:

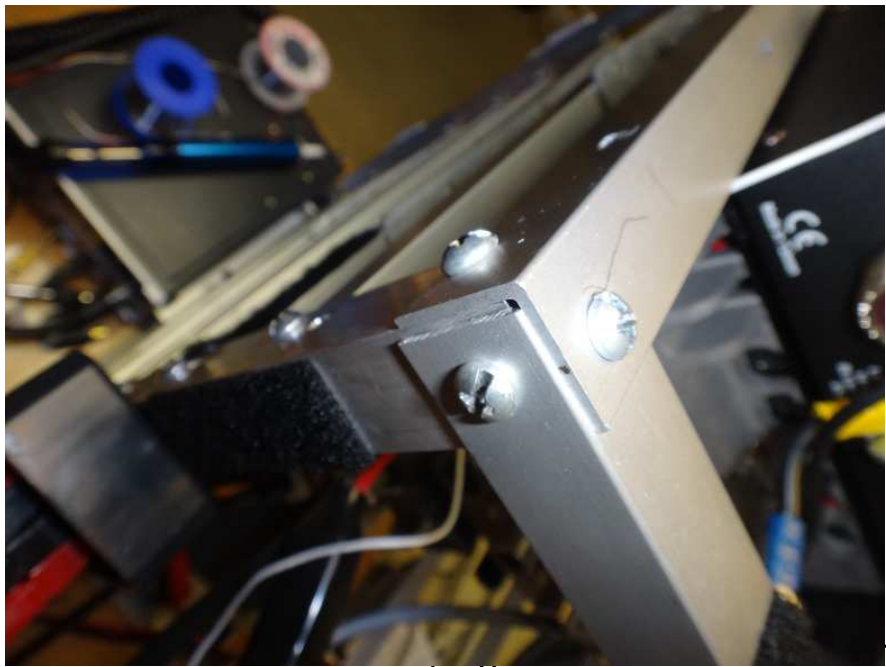
### Use memory chaining for the Winkeyer

<b>M1: WW7D//R</b>	<b># WW7D/R</b>
<b>M2: CN96</b>	<b># Current Grid – Change as required</b>
<b>M3: TU /C2 K</b>	<b># Reply: TU &lt;call M2&gt; K</b>
<b>M4: R 73</b>	<b># Salutation: R 73</b>
<b>M5: CQ CQ DE /C1 /C2 K</b>	<b># CQ CQ DE &lt;call M2&gt;&lt;call M1&gt; K</b>
<b>M6: QRZ DE /C1 /C2 K</b>	<b># QRZ DE &lt;call M2&gt;&lt;call M1&gt; K</b>

- Only change M2 during the contest
- Speed up (/Y5) and slow down (/Z5) CQs, QRZ etc.



Racking:





Getting power into the cab:







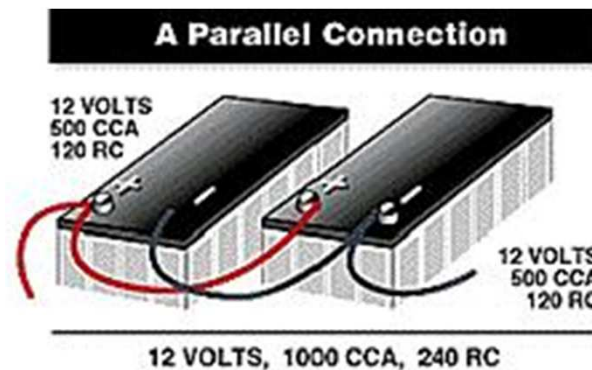
Developing a Limited Rover Station



PNWVHFS 2014 Conference

## More advanced power:

- Parallel second battery
  - Safety: Contained, secured, properly fused
  - Ordinary automobile battery is usually fine
    - Reserve capacity ( $\times \sim 2$  to 4) will be longer than your stops!
    - e.g. My truck's *Interstate*: RC=100 mins at 25A



- Use similar batteries (capacities, age)

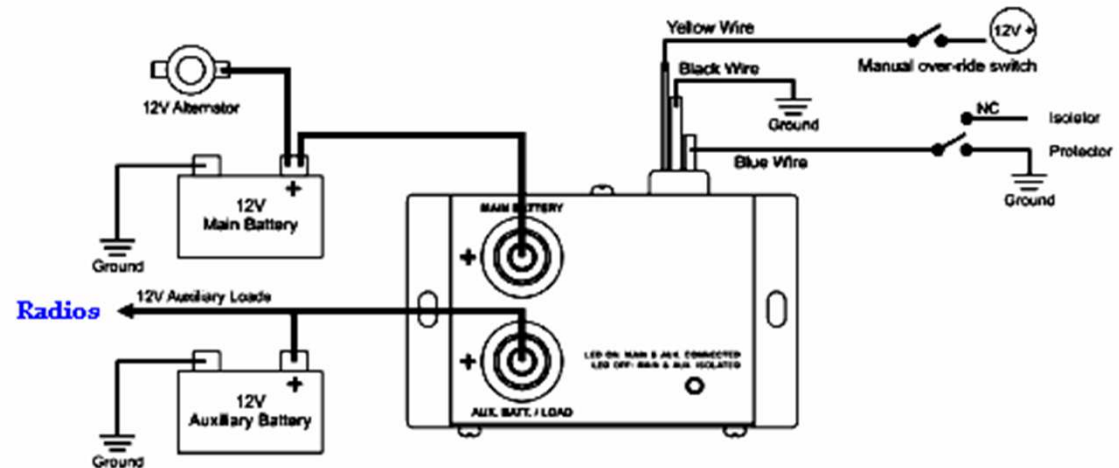


## More advanced power systems:

- Isolators:



TYPICAL WIRING DIAGRAM AS BATTERY ISOLATOR & MANUAL OVER-RIDE SWITCH



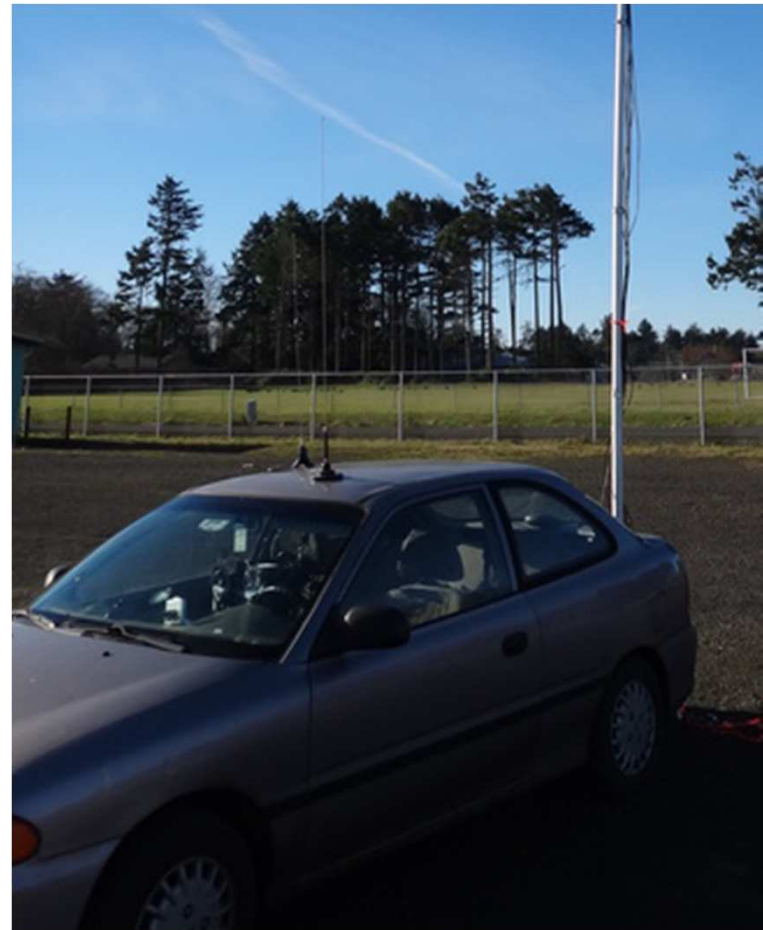
- Power boost regulators:

e.g. N8XJK Super Booster, 40 amps, RF enabled



## Antennas:

- Most stations use horizontal polarization (exceptions: FM on 6m, 2m, 432 MHz, 927.5 MHz)
- Vertical antennas will work (but down some db). Use what you have.





# Simple 6m directional antennas

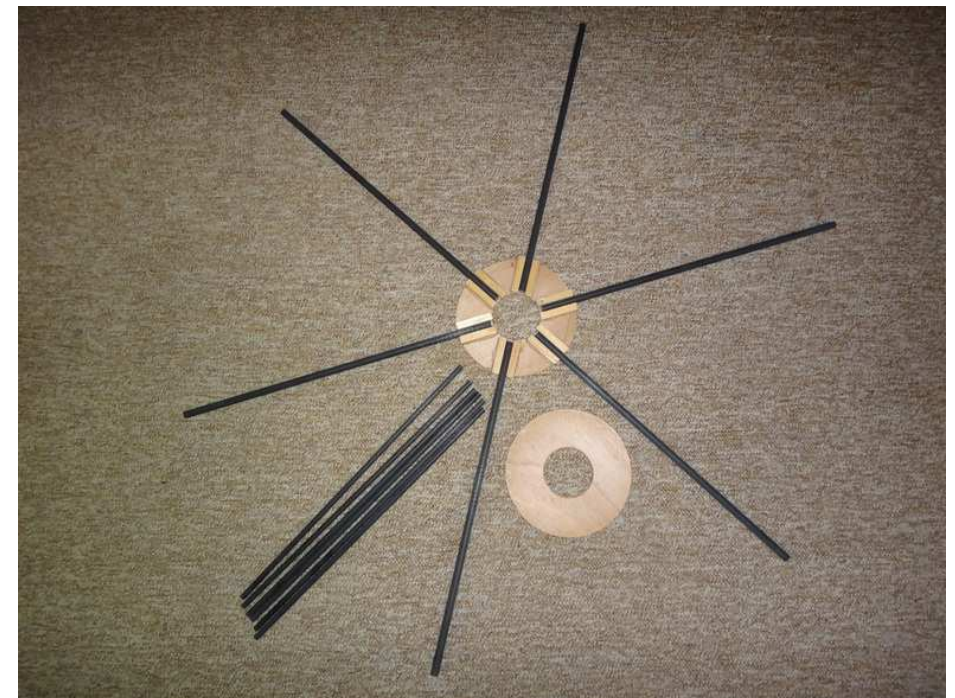
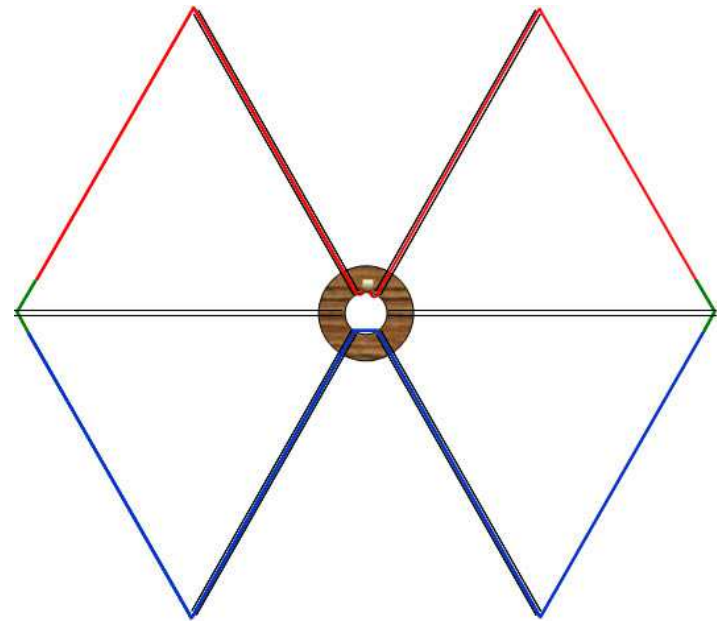
## The Moxon (2 ele)



# Simple 6m directional antennas

The Hexbeam (2 ele)

Small turning radius ( $< 3'$ )



*Contact me for construction information*

Developing a Limited Rover Station



# Cockpit Information

- Stand-alone GPS

(Ideally, waypoints programmable via lat/long coordinates)

- Maidenhead grid (GPSTest app on old smartphone)
- Altimeter?
- 24 hour UTC clock
- Suitable lighting
- Voltage monitor?



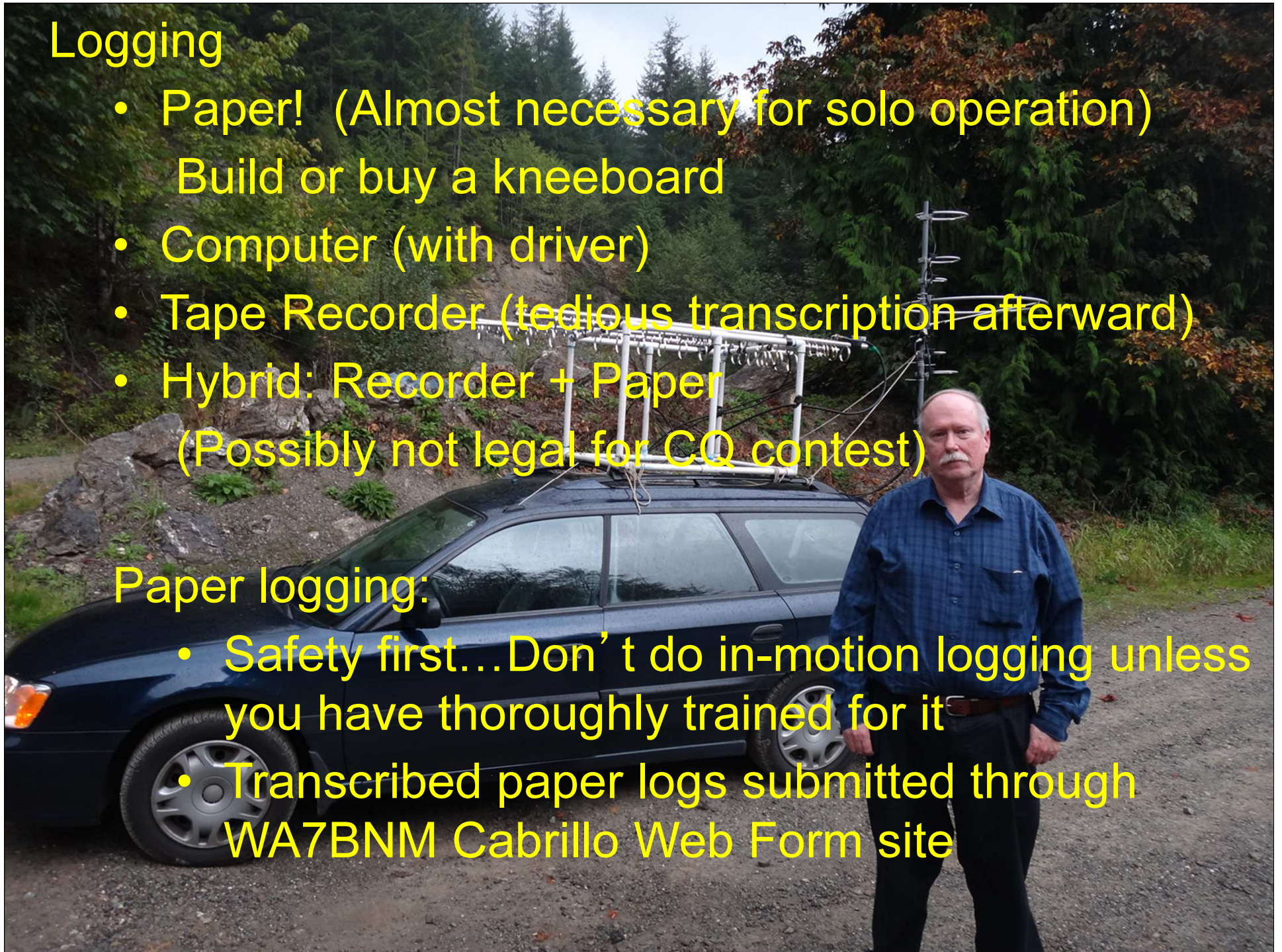


## Logging

- Paper! (Almost necessary for solo operation)  
Build or buy a kneeboard
- Computer (with driver)
- Tape Recorder (tedious transcription afterward)
- Hybrid: Recorder + Paper  
(Possibly not legal for CQ contest)

## Paper logging:

- Safety first...Don't do in-motion logging unless you have thoroughly trained for it
- Transcribed paper logs submitted through WA7BNM Cabrillo Web Form site





# The REAL secret for successful roving...

# The REAL secret for successful roving...

## Planning, Planning, Planning

The Internet has revolutionized rover planning

Google maps: an incredible resource

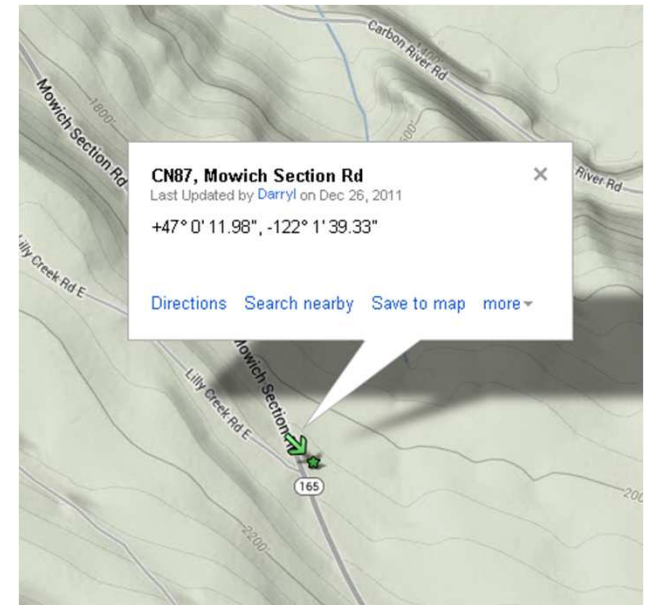
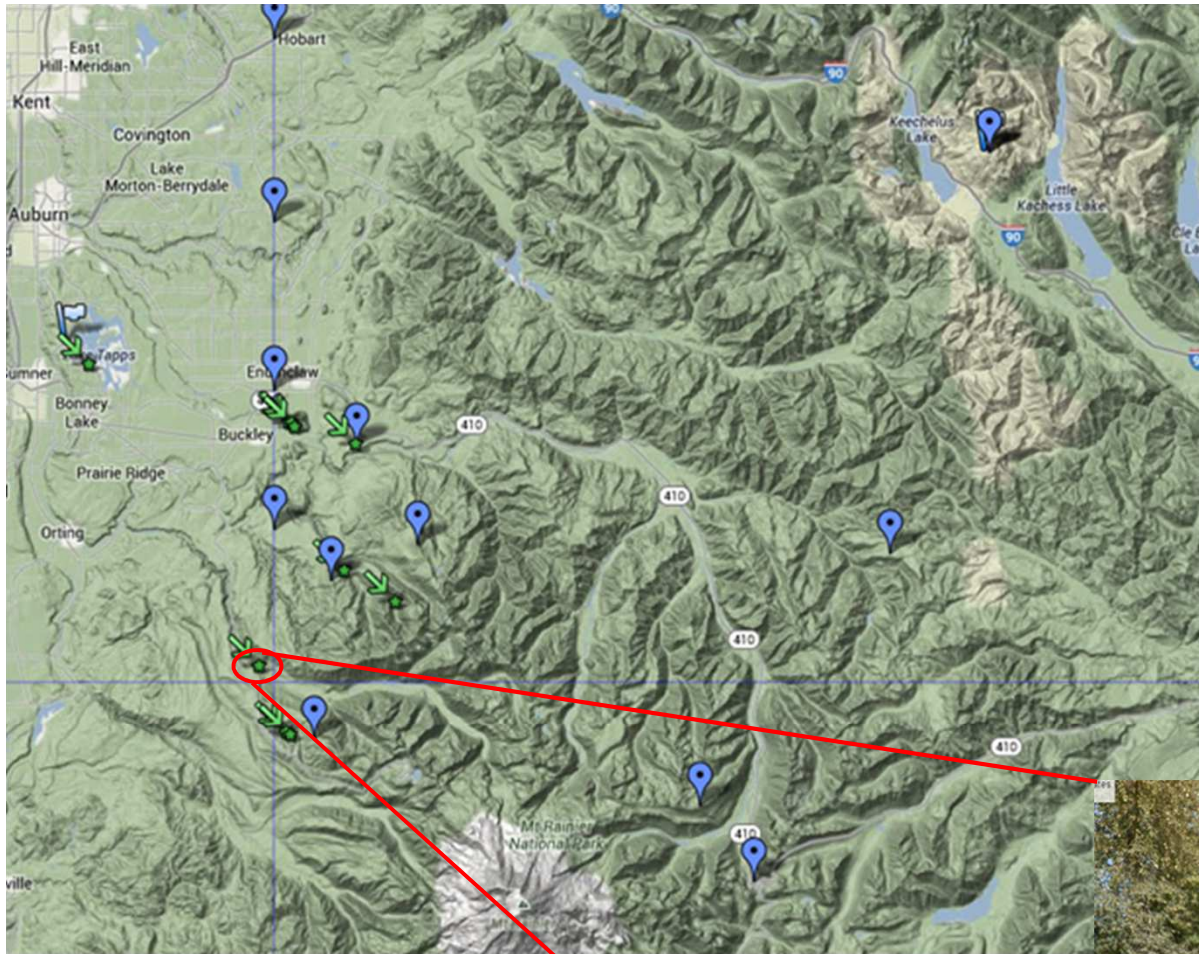
Terrain

Street view

Myplaces personal maps

Route timing

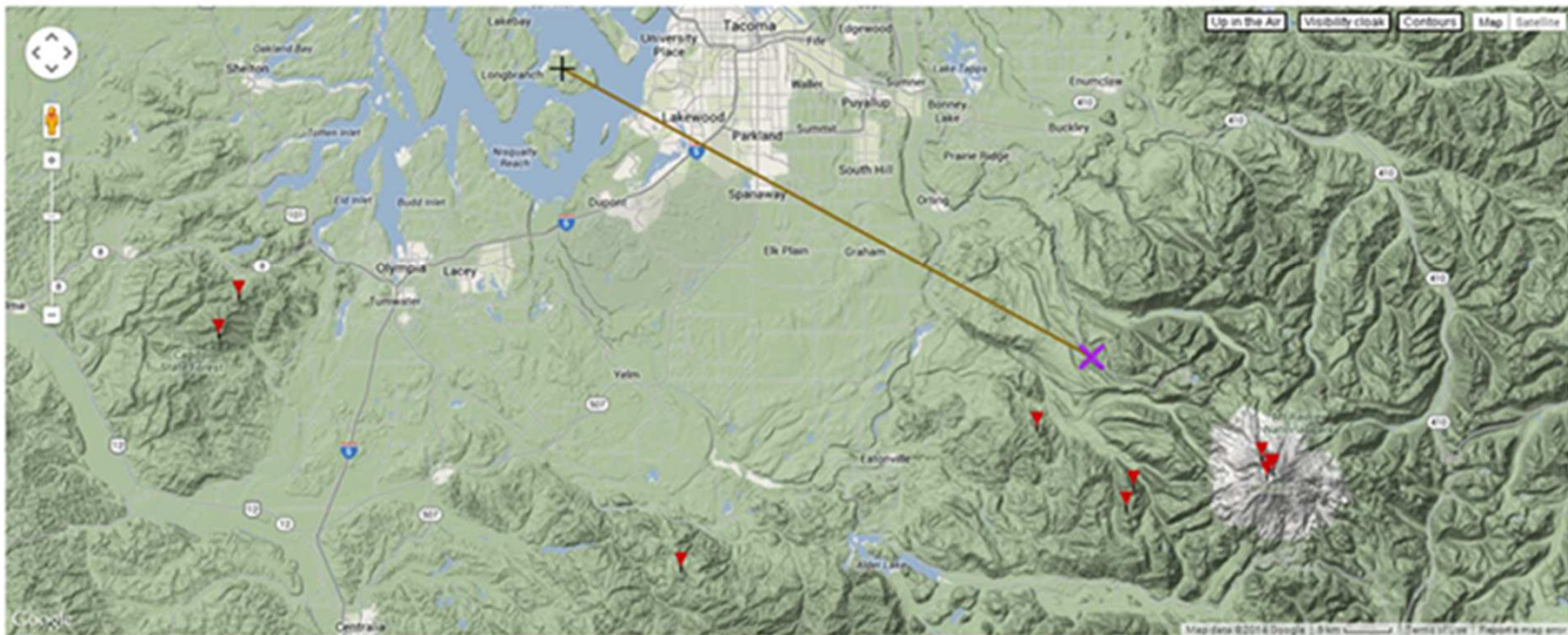
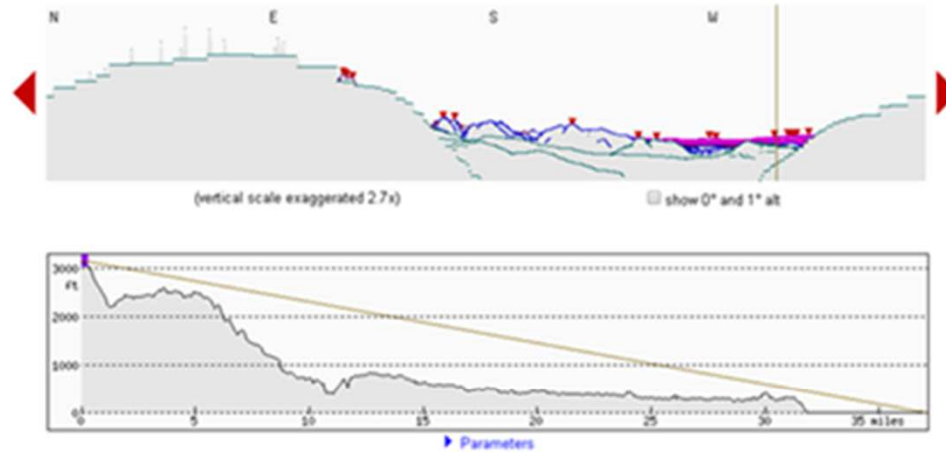




Developing a Limited Rover Station



<http://www.heywhatsthat.com/>





# K7BWH's rover site (Washington, Oregon, Idaho)

<http://www.k7bwh.com/cn88.html>

Contribute new  
rover locations  
through a web form

SiteTheoryCoilgunsLevitatorsProjectsHam Radio

Sitemap

Ham Radio

Topics: VHF RoverWashingtonOregonHam Radio

Washington  
Rover Locations

1. WA Map
2. WA List
3. WA from CN87
4. Rare WA Grids
5. WA Counties
6. CN76 Long Beach
7. CN77 Forks
8. CN78 Sekiu
9. CN85 Portland
10. CN86 Centralia
11. CN87 Seattle
12. CN88 Belling'm
13. CN95
14. CN96 Yakima
15. CN97
16. CN98 Mt Baker
17. DN05
18. DN06 Tri-Cities
19. DN07
20. DN08 Okanogan
21. DN16 Pullman
22. DN17 Spokane
23. DN18
24. Data Check
25. Submissions


<>

Grid Square CN88

This page - [Mt Erie](#) - [Mt Anderson](#) - [Little Mountain](#) - [I-5 Smokey Point](#) - [Lake Stevens HS](#)

A list of VHF rover sites in Washington's grid CN88. [Be careful](#).  
Hover mouse over a map marker for more about the grid and site.

MapSatellite





RichmondSurreyDeltaLangleyAbbotsfordChilliwackTsawwassenWhite RockBellinghamAnacortesBurlingtonMt VernonSedro-WoolleyArlingtonMarysvilleEverettLake Stevens


Map data ©2014 Google Terms of Use Report a map error


**Mt Erie, CN88qk49**










Latitude	Longitude
48.454193	-122.625230
48 27.2516	-123 22.4862'
48° 27' 15" N -123° 22' 29" W	

 Near city of Anacortes, [Skagit County](#), WA, Altitude 1200

 See [Google map](#), [Bing map](#), [Mapquest](#), [OpenStreetMap](#), [Beam heading](#)

 Last update: 2012-11-03

 Comments by: Eric [KB7DQH](#)



Driving  
Directions  
Map

Developin

DAY 1:

Home

1. **CN76 Ocean Shores @46.998841, -124.144098**
2. **CN77 Ocean Shores @47.012062, -124.147719**
3. CN77-CN87 Hoquiam (Alt) @47.057857, -123.999993
4. CN87-CN86 Hoquiam (alt) @46.999997, -123.904454
5. CN86-CN87 Elma @47.000012, -123.408272
6. CN87-CN86 border Tumwater @46.999690, -122.912342
7. **CN86 China Garden Road @46.019301, -122.782412**
8. **CN85 1785' spot (Larry's property) @45.979347, -122.753753**
9. **CN85-CN95 @45.635966, -121.999980**
10. **CN95 N. Bonneville spot 1 @45.642008, -121.985687**
11. CN85-CN95 @45.635966, -121.999980
12. CN85--CN86 (N) @45.999999, -122.842290
13. Motel 6 Centralia: 1310 Belmont Ave, Centralia, WA (360) 330-2057

DAY 2:

- Motel 6 Centralia: 1310 Belmont Ave, Centralia, WA (360) 330-2057
14. CN86-CN87 border Tumwater @46.999690, -122.912342  
CN87 Mowich Lake Rd @+47° 0' 11.98", -122° 1' 39.33"
  15. **CN96 Mowich Lake Rd @ 46.951478, -121.983840**  
**CN86 Mowich Lake Rd @46.959528, -122.001302**  
CN87 Mowich Lake Rd @+47° 0' 11.98", -122° 1' 39.33"
  16. CN87--CN97 boundary @47.191987, -121.999925
  17. **CN97--Mud Mtn pullover @47.154675, -121.921143**
  18. Black Dia CN87-CN97 @47.301614, -121.999919
  19. CN88-CN87 Border Hwy 204 @48.000016, -122.112954
  20. **Lake Stevens HS CN88 @48.022941, -122.079263**
  21. CN98-CN88 Border Hwy92 @ 48.079742, -122.000011



		Begin	End	Set-up Op down Next			
Saturday		Start	09:00 AM				
--	Home		08:00 AM	08:00 AM	0	0	0 165
CN76	Ocean Shore 16'		11:00 AM	12:15 PM	15	75	5 5
CN77	Ocean Shore 15'		12:30 PM	01:45 PM	5	75	5 20
CN77-CN87	Hoquiam --		02:10 PM	02:15 PM	0	5	0 10
CN87-CN86	Hoquiam --		02:25 PM	02:25 PM	0	0	0 35
CN86-CN87	Elma --		03:00 PM	03:00 PM	0	0	0 30
CN87-CN86	Tumwater --		03:30 PM	03:30 PM	0	0	0 80
CN86	Kalama, WA 1700'		04:55 PM	05:55 PM	5	60	5 20
CN85	Kalama, WA 1785'		06:25 PM	07:40 PM	5	75	5 70
CN85-CN95	Bonneville		08:55 PM	08:55 PM	0	0	0 5
CN95	Bonneville 100'		09:05 PM	10:05 PM	5	60	5 5
CN85-CN95	Bonneville		10:15 PM	10:15 PM	0	0	0 65
CN85-CN86	Kalama, WA		11:20 PM	11:20 PM	0	0	0 50
Hotel	Centralia --		12:10 AM	12:10 AM	0	0	0
Sunday			06:15 AM				
Hotel (CN86)	Centralia --		06:15 AM	06:15 AM	0	0	0 20
CN86-CN87	Tumwater --		06:35 AM	06:35 AM	0	0	0 75
CN87-CN86	Carbonado 2050'		07:50 AM	07:50 AM	0	0	0 15
CN96	Carbonado 3200'		08:10 AM	09:35 AM	5	85	5 5
CN86	Carbonado 2800'		09:50 AM	10:35 AM	5	45	5 10
CN87	Carbonado 2050'		10:55 AM	11:45 AM	5	50	5 30
CN87--CN97	Enumclaw --		12:20 PM	12:20 PM	0	0	0 15
<b>CN97</b>	<b>Buckley (M 1200'</b>		<b>12:40 PM</b>	<b>02:05 PM</b>	<b>5</b>	<b>85</b>	<b>5 25</b>
CN97--CN87	Black Diamond--		02:35 PM	02:35 PM	0	0	0 70
CN87-CN88	Lake Stever--		03:55 PM	03:55 PM	10	0	0 15

## Two challenges for you:

### 1. Next weekend is the Microwave Sprint.

- Buy or borrow a 902 MHz or 1296 MHz rig
- Build an antenna (WA5VJB “Cheap Yagi”?)
- Find a grid intersection to circle

### 2. Use the winter to build a station and develop a roving plan for the 2015 January VHF contest



# Acknowledgments:

- Etienne, K7ATN, for discussions, comments, and photos
- John, W7FU, for rig diagnostics
- Eric, N7EPD, for answering questions, conducting on air tests, support and encouragement
- Barry, K7BWH, for inspiring discussions, and a great rover site
- Mike, KD7TS, for long discussions on VHF+ topics
- Kathy, for putting up with it all

