# Be Radio-Active!

*K6UFO*

*Mark “Mork” Aaker*

# Who is K6UFO?



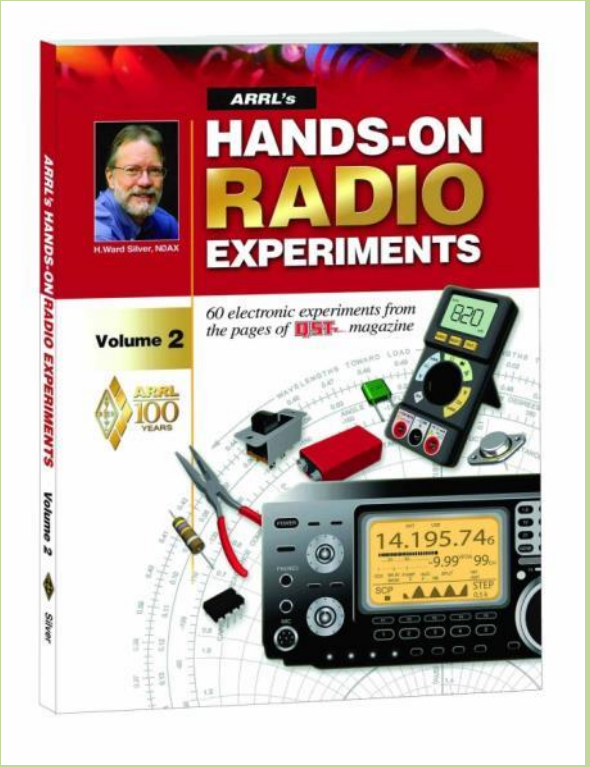
Alien from San Francisco, CA.


Operates station on **Vashon Island, WA.**

- Licensed since 1971.
- Has operated radio from five countries.
- Has contacted every radio country.
- Has won the "National Championship" ARRL Sweepstakes, Morse code & voice.
- Still having fun …

# Amateur Radio is a valuable activity:

Emergency Communications




Promote International Goodwill

Promote technical learning, skills and advancement of the radio art.

# AND… it can also be FUN!

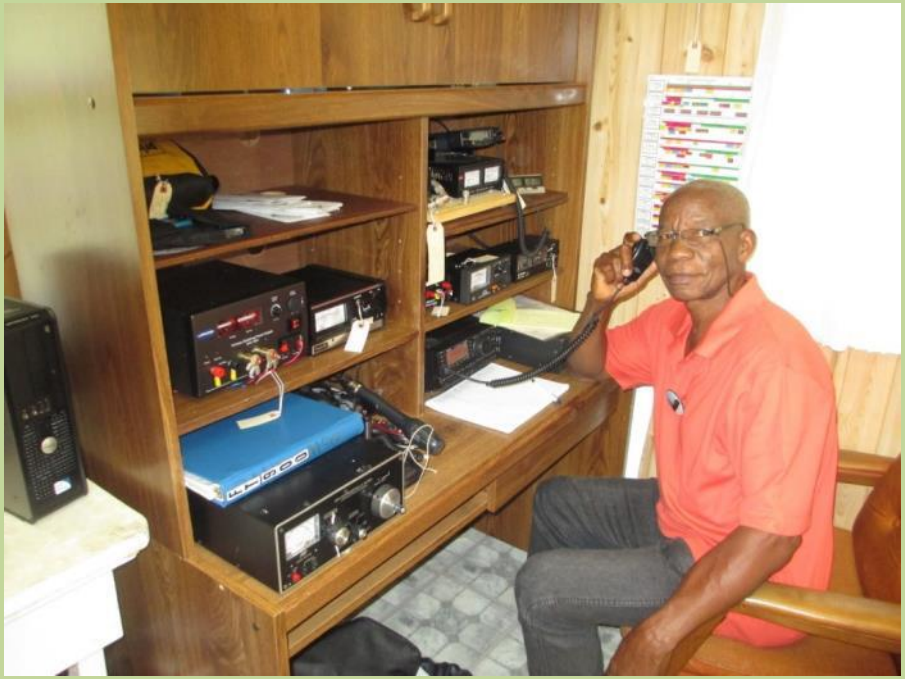
Field Day

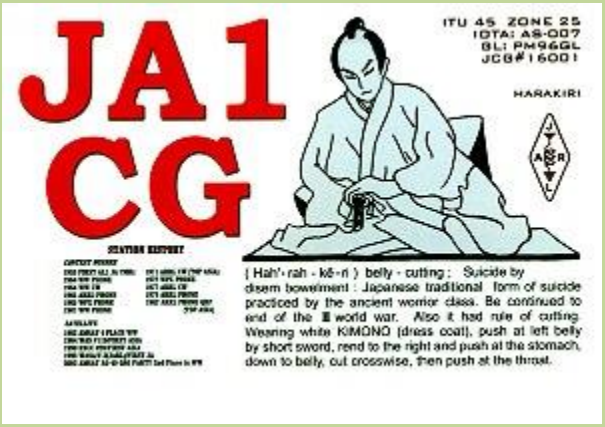
Summits On The Air (SOTA)

Talking via Satellites

# …and more FUN!

Talking to other countries





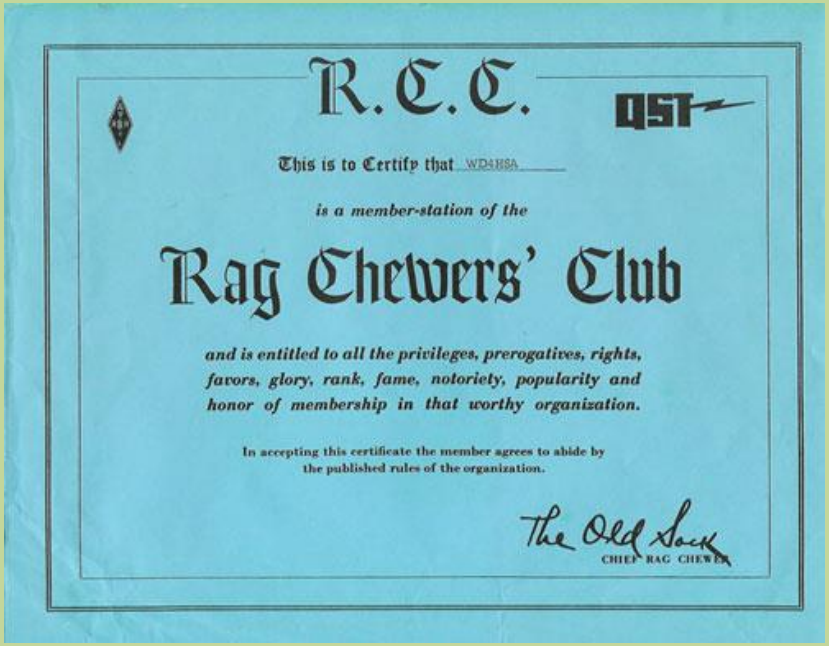

# …and more FUN!


Building antennas

Building equipment


# …and more FUN!

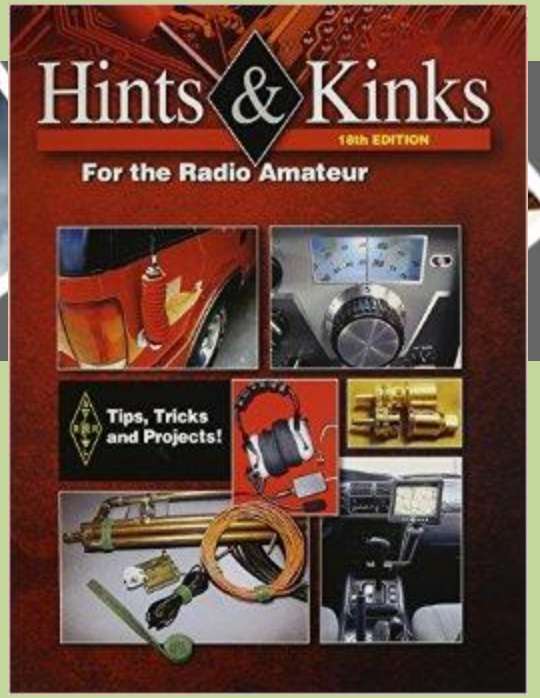
Awards





On-the-air Contests

**So, find an aspect of Amateur Radio that sounds interesting, or fun, or challenging - and try it for awhile. There is lots of information available on the internet, in books and from other Hams.**


**THE CW OPERATORS' CLUB**

*Celebrating The Unique Art Form Of Morse Code*

**…if you stop enjoying it, take a break or try something else.**

# Remember I showed you:

Field Day

Summits On The Air (SOTA)

**Talking via Satellites**

# MTN, Inc.

## “Talking to the Space Station”

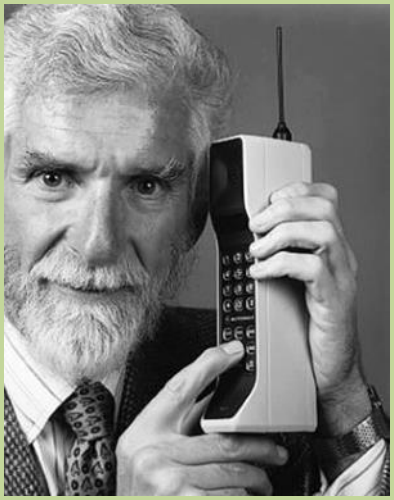
MTN 'Space' - YouTube.mp4

**Thank you MTN**
**for providing a “inspiring” view**
**of Amateur Radio!**

**I had a “Sam calling the Space Station”**
**moment when I was a youngster,**
**back in 1983…**

**Astronaut Owen Garriot was a ham, W5LFL.**
**He wanted to be the first to operate Amateur Radio from the Space Shuttle.**





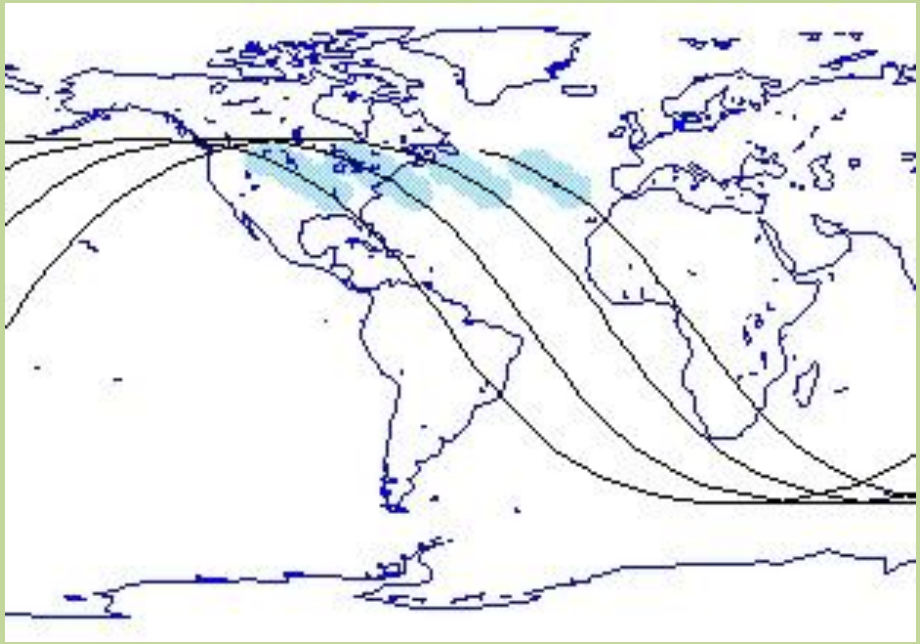
**Remember, this was 1983!**

# With the help of NASA, Motorola and others, a handheld 2 meter FM radio and a “window” antenna were prepared and “space-qualified.”

The plan: during some of his “free-time” he would operate on the 2 meter band.

Some contacts were pre-arranged (King Hussein of Jordan, some student classrooms) but for everyone else, it would be a “Pileup!”

# Using 2 meter FM only the one LOUDEST station would get through due to the FM “capture effect.” So how to be the LOUDEST?



We learned how to plot orbits of the Space Shuttle. When he was coming in toward the USA from the Pacific Ocean we would have a good “first shot” at him.

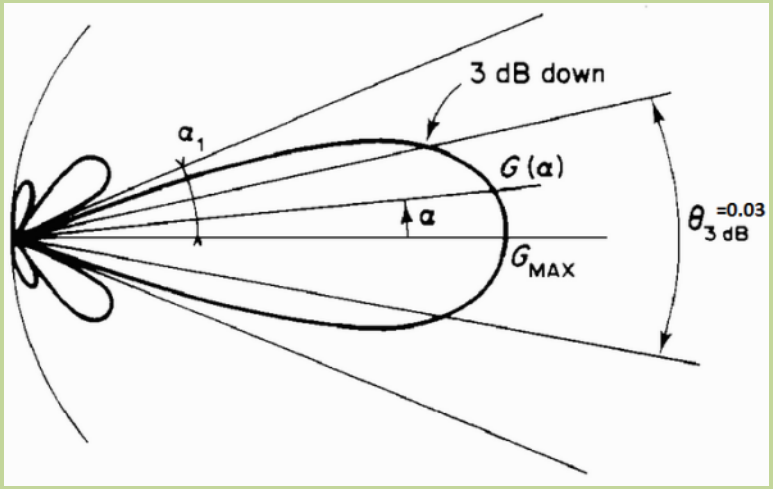
We had 2 meter FM mobile radio and a 100 watt amplifier. Now we needed a good <u>antenna</u>…

**Not good enough…**

Still not good enough…

OK, Maybe good enough!

**Radio Astronomy dish run by SRI International for the Physics Department of Stanford University. 150 ft diameter with estimated gain of 36 dBi. So our 100 watts provided an Effective Radiated Power of 242 Kilowatts!**




Problem: The Space Shuttle moves across the sky faster than "The Big Dish" can move. We would have to start early, "lead" the shuttle, let it pass by our antenna pattern, and hope the timing worked.

Here is the recording made by Owen Garriot W5LFL on the space shuttle…

W5LFL.wav

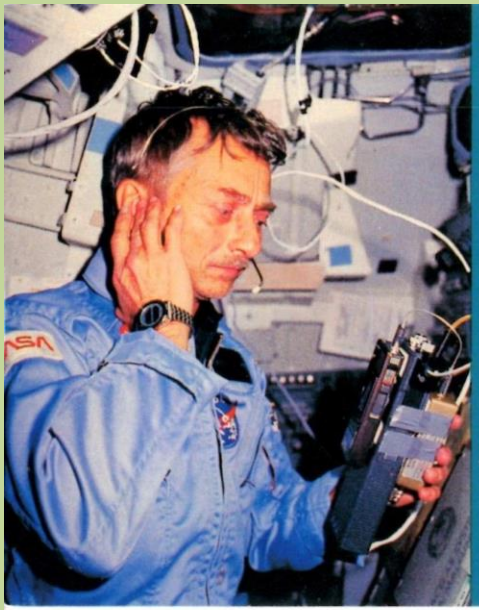
# What W5LFL heard on the space shuttle…

That's my friend Scotty W7SW reading our call signs as fast as he can.

My call sign at the time was NT6G.
W6YX was the Stanford Radio Club.

AJ6L was a big "Moonbounce" operator at the time in So. Calif., who worked at French company Arianespace.

# And I got the QSL card to confirm it!



**W5LFL**
from the
Spacecraft
Columbia

ARRL


**FLIGHT OF COLUMBIA**
**STS-9/Spacelab-1**

Launched on November 28, 1983
and after 247 hrs, 47 min
landed at Edwards A.F.B. on December 8, 1983

- First launch of Spacelab (provided by the European Space Agency)
- Longest Orbiter flight to date
- First European crewmember
- First 'Payload Specialists' (non-career astronauts)
- First six-person spaceflight

★ First Amateur Radio station in space:
W5LFL

*Transceiver:* modified Motorola MX-300 2-meter FM transceiver, hand-built by the Motorola Amateur Radio Club in Florida.
*Antenna:* directional ring radiator with cavity, designed to fit in the upper window of the spacecraft; built for NASA by volunteer employees of Lockheed.
*Power:* 4.5 watts
*Mode:* FM, CW (by keying carrier) All transmit and receive audio were tape recorded, which constitutes the station log.
*Operating orbits:* 40D, 56D, 62A, 71D, 91A, 96A, 97A&D, 110D, 111A&D, 112A, 113A, 129A, 130A, 134A, 134D, 135A&D, 144A&D, 145A&D, 146A, 149D and 150D.
*Stations, 2-way contact:* over 350
*SWL:* approximately 10,000 cards received
*Countries:* 23
*Total operating time:* about 4 hrs, 30 mins.

**W5LFL/NT6G**

**Space Shuttle Columbia**

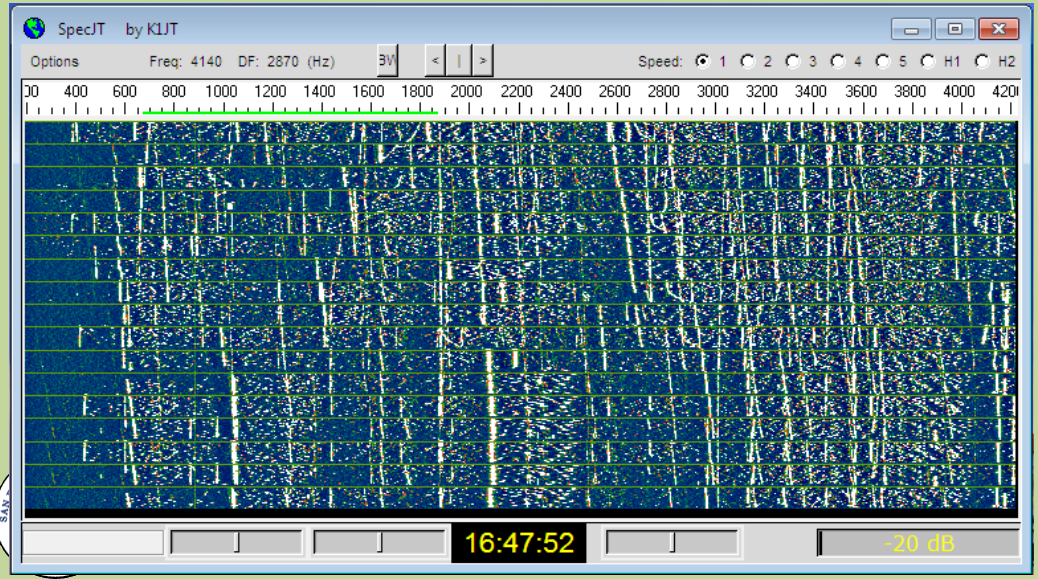
This confirms a two-way contact on 2 meters with Scientist/Astronaut Owen K. Garriott, W5LFL, operating in space from aboard Columbia on the flight of STS-9/Spacelab-1 between 28 Nov. and 8 Dec., 1983.

73, Owen

Owen K. Garriott, W5LFL

# Speaking of “Moonbounce,” yes, you can talk to other stations by bouncing your signals off the moon!

Can be accomplished by a “good" station on 2 meters or 440 MHz, using a WSJT mode, with 100 watts or more to a 9 to 14 element antenna (about 14 feet long). Here's a 9 element antenna at K4MSG. This setup would also be great for bouncing signals off meteors, and other VHF activities.




Several dozen Amateur Radio signals from off the moon and received at KP4AO at Arecibo Observatory, Puerto Rico. (Yes, its another “Pileup!”)

# But enough about the VHF bands: 2m and 440 MHz... What about the “HF Bands?”

If you upgrade from Technician to General (a little study and a multiple choice exam) you expand where you can operate on the HF Bands, many new activities become available and signals often travel around the world!


A popular activity is working “DX” or "distant countries.“ Eventually, you'll be looking for the rare ones like Clipperton Island. They try it to make it as "easy" as possible to find them, to confirm if they've got you in their logbook, and to get a confirmation by postcard, a "QSL Card", or in the electronic database at Logbook of the World (LoTW).

Add New Post ‹ Clipper... | CLIPPERTON ISLAND - ... | DXA2

Web www.dxa2.org Search with Google

# =DXA= Version 2

# Clipperton Island

2 Mar - 10 Mar 2013

DXpedition Call Sign

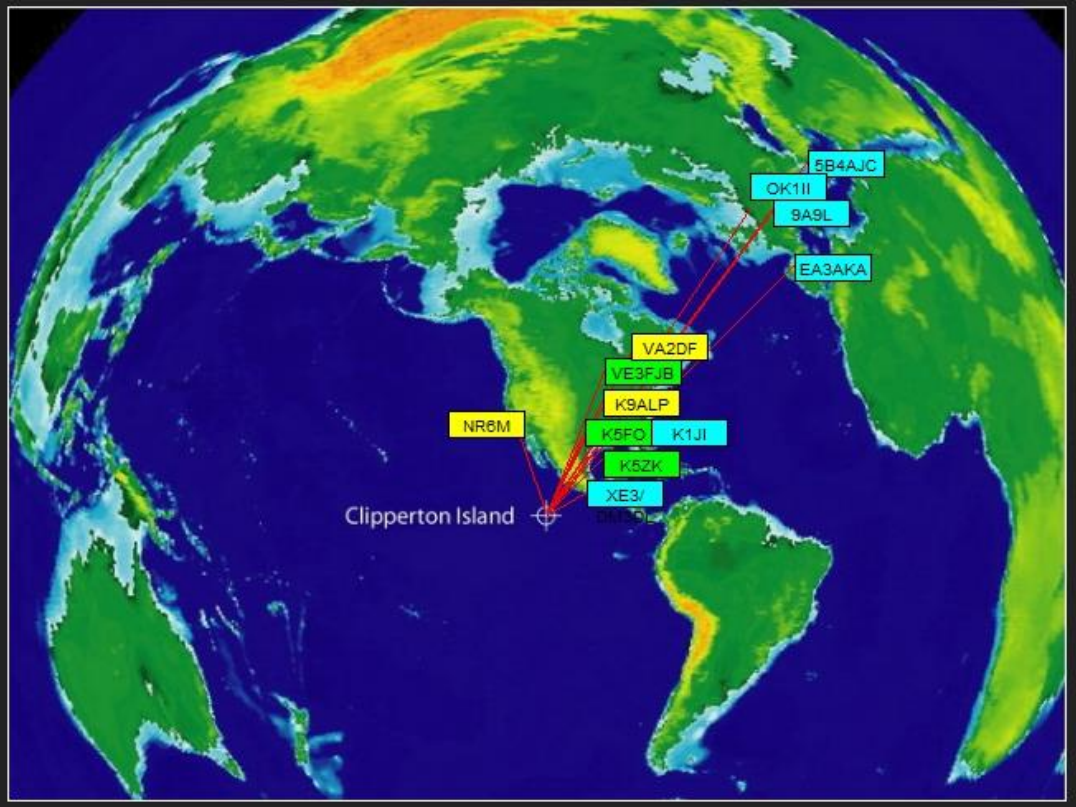
TX5K

TX5K Home

TOGGLE MAPS
TOGGLE DATA

SOUND
Refreshes in 49
PAUSE

QUICK TIPS
HELP
DXA HOME
PRIVACY
ABOUT
CONTACT




CURRENT

K5FO
9A9L
K9ALP
5B4AJC
EA3AKA
NR6M
VE3FJB
XE3/
DM3DL
VA2DF
K1JI
OK1II
K5ZK

PREVIOUS

- 0407 UTC -
WB3AVN
KH6CG
W3GH
K1SLB
DK4US
KK4CLY
EA8TL
AH6RR
KJ4UZU
VK7CW
DJ6YX
N6BM
LZ1QN

MESSAGE FROM TX5K

Some QSOs that you may have made may not appear in the DXA database. We hope to upload them from the TX5K log tomorrow. Please be patient. You are probably in the log, we just don't have your QSO uploaded yet due to the startup problems we had.

CALL SEARCH

KY6R
Please enter...
...a valid callsign

CONFIRM KY6R LOGGED

| | 160 | 80 | 40 | 30 | 20 | 17 | 15 | 12 | 10 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| CW | ■ | | | | | | | | | |
| SSB | | | | | | | ■ | | | |
| DIGI | | | | | | | | | | |

CURRENTLY TX5K WORKING

| | 160 | 80 | 40 | 30 | 20 | 17 | 15 | 12 | 10 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| CW | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| SSB | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| DIGI | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

TIME REMAINING

7 d 14 h 52 m
Sun, 03 Mar 2013
04:07:58 UTC

TOTAL QSOs

4457
CW SSB DIGI
959 636 291

SAN FRANCISCO RADIO CLUB W6PW MAY 19, 1919

# I mentioned "Power" back there …
# "an Effective Radiated Power of 242 Kilowatts"

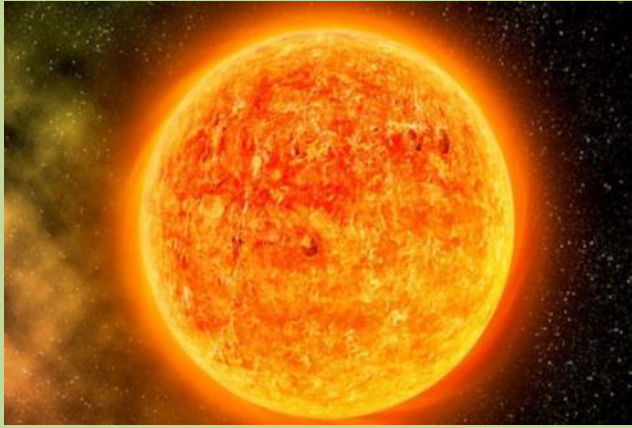
**HIGH Power**
up to 1,500 watts

I became interested in how much, or how little power was needed to make radio contacts.

**LOW Power**
up to 100 watts

**QRP**
up to 5 watts

# How **MUCH** Power?



- Total Energy Output of the Sun  10^26 W
- Nuclear reactor  1 Gigawatt  = 10^9 W
- Shortwave Broadcast  1 Megawatt = 10^6 W
- AM/FM radio Broadcast  50,000 W
- Digital TV Broadcast  10,000 W
- Amateur Radio  1,500 W
- Microwave oven  1,000 W @ 2.45 GHz

# How **little** Power?

- Amateur Radio 1,500 W – 100 W – 5 W
- Christmas tree bulb  7 W – 5 W
- CB Radio  4 W
- LED Flashlight  3 W – 1W
- Cell phone  2 W - 0.002 Watt
- WiFi transmitter 100 milliwatt – 0.1 mW
- Equivalent light output of a Firefly  1 mW


**I started to figure out:**
**How to make low power work…**

**The simple answer was …**

# Propagation Path-Loss - Free Space Propagation

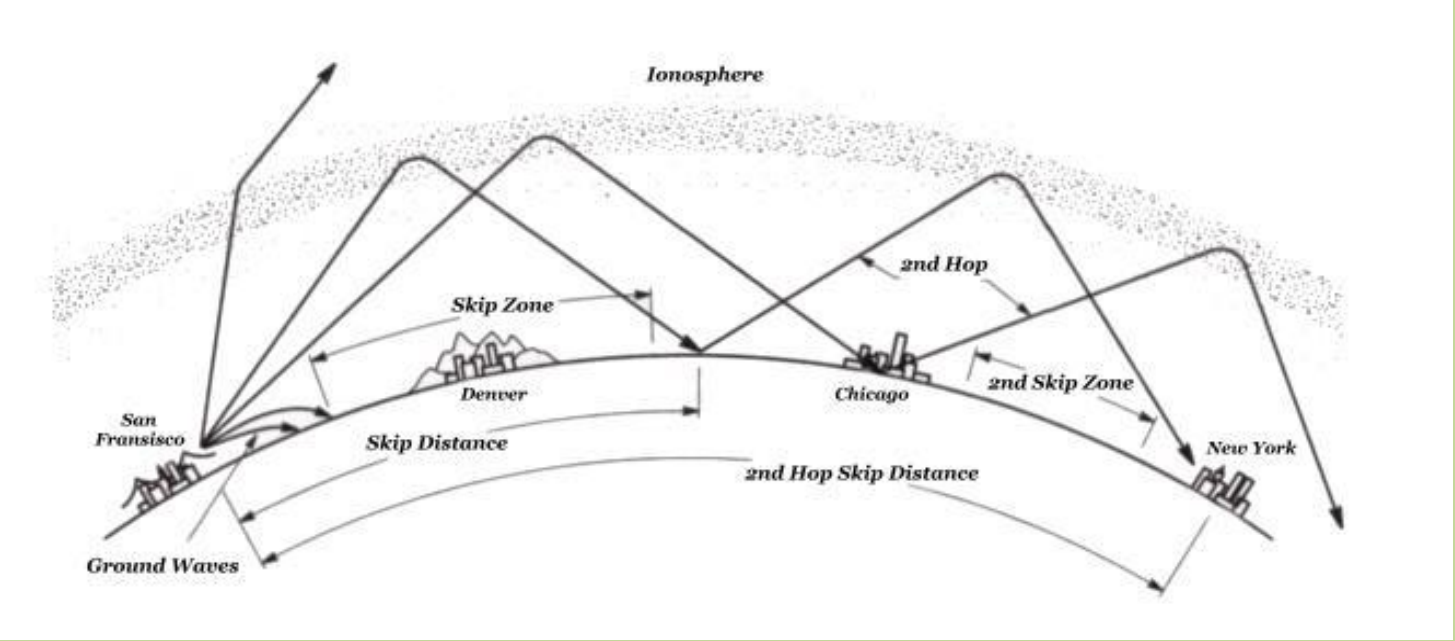
- ✓ The free space propagation model is usually used to predict received signal strength, when the transmitter and receiver have a clear, unobstructed line-of-sight (LoS) path between them.
- ✓ In free-space propagation environments the received signal power decays with the square of the propagation path length, and the received signal power can be expressed as

$$P_r(d) = 10\log_{10}\left[P_t G_T G_R \left(\frac{\lambda}{4\pi d}\right)^2\right] \quad \textbf{dBm (dBW)} \qquad (1)$$

where $P_t, P_r(d)$: transmitted and received power, $G_T$, $G_R$: antenna gains, $d$: distance between the transmitter and receiver, and $\lambda$: wavelength of the radio signal.

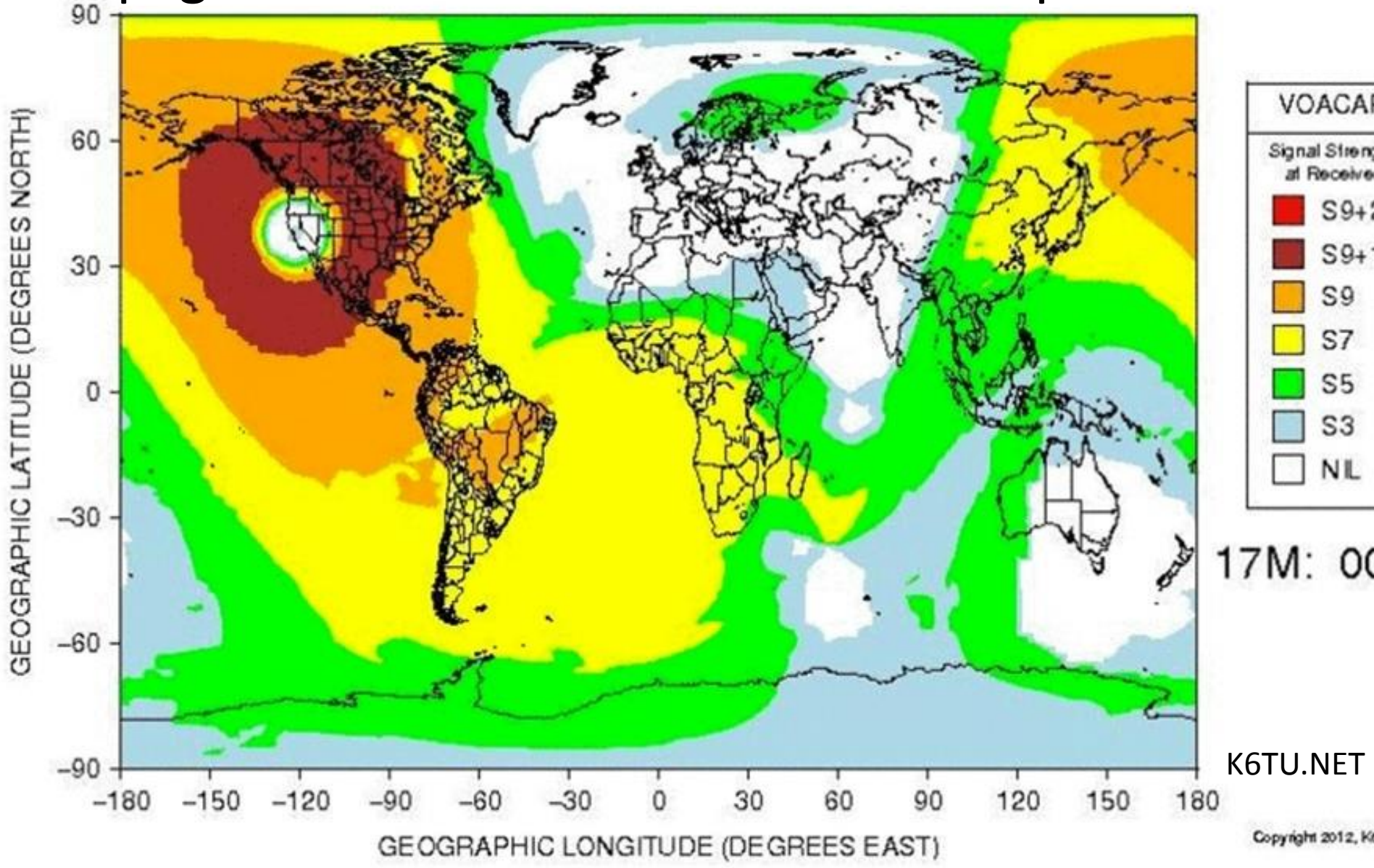
# *Just Kidding!*

It turns out the limiting factor is not your power, but the “Propagation”
i.e., whether the band is “open.”




**Ionosphere:** Signals refracting from the ionosphere experience from minimal loss (essentially path loss) to total loss (beyond MUF) or total absorption (daytime D layer).

# We now have elaborate computer models of Propagation and whether the band is “open.”



# So at the right time, on the right band, with a good antenna – you can make contacts with very little power.

- Heres' what I use at NN7SS in Washington.

- ✓ Efficient
- ✓ Low Loss
- ✓ High up
- ✓ Well matched

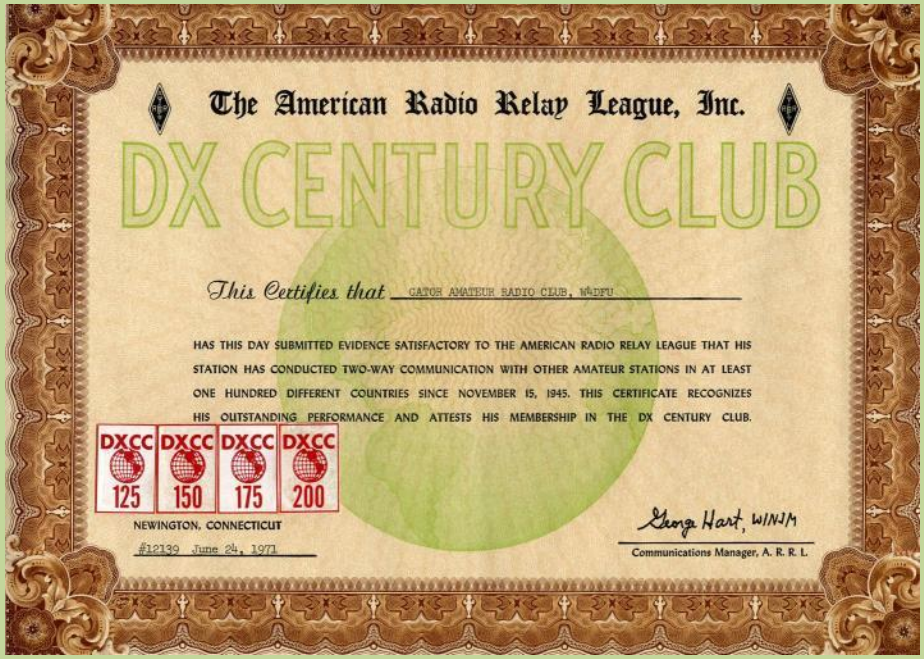
# I used as my “ruler,” the DX Century Club “DXCC”, where you contact **100** different countries.

It took me 16 years (1971 – 1987) to contact 100 countries the first time, using up to 500 watts!

Then in 2003, I contacted 100 countries in one weekend, using 1,000 watts.

I skipped over “Low Power” of 100 watts, and went down to 5 watts.

Finally, in 2011, I contacted 116 countries in one weekend, using 5 watts!


The American Radio Relay League, Inc.

DX CENTURY CLUB

This Certifies that CATCH AMATEUR RADIO CLUB, W6DFU

HAS THIS DAY SUBMITTED EVIDENCE SATISFACTORY TO THE AMERICAN RADIO RELAY LEAGUE THAT HIS STATION HAS CONDUCTED TWO-WAY COMMUNICATION WITH OTHER AMATEUR STATIONS IN AT LEAST ONE HUNDRED DIFFERENT COUNTRIES SINCE NOVEMBER 15, 1945. THIS CERTIFICATE RECOGNIZES HIS OUTSTANDING PERFORMANCE AND ATTESTS HIS MEMBERSHIP IN THE DX CENTURY CLUB.

DXCC 125 DXCC 150 DXCC 175 DXCC 200

NEWINGTON, CONNECTICUT

#12139 June 24, 1971

George Hart, W1NJM

Communications Manager, A. R. R. L.

# Alternate Views:

- Life is too short for low power!
- All knobs to “11”
- Loud is good. Louder is better!

Why did I say I worked 100 countries

**“in one weekend?”**

Because it was during a **Radio Contest!**

Radio Contests are a FAST way to work lots of stations, new countries, and get your fill of radio operating.

The biggest radio contest, the CQ World Wide DX Contest has over 12,000 stations on the air, with everybody able to contact everybody, but especially looking for new countries and new “Zones.”

C6ARW.flv

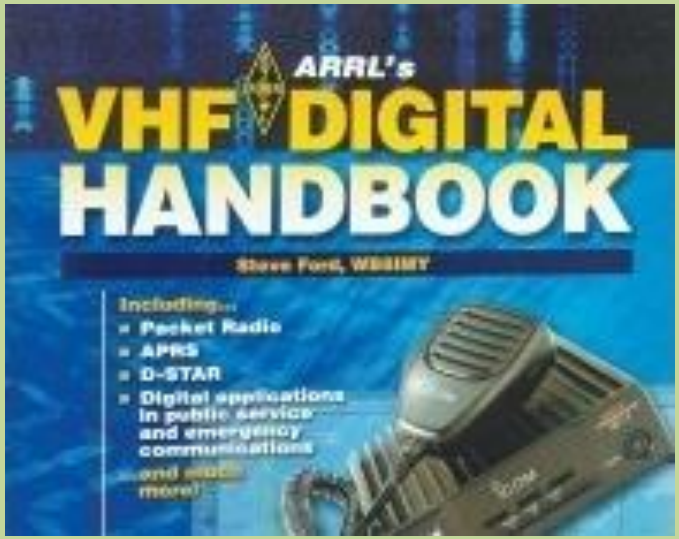
Here's station **C6ARW** in the Bahamas in a contest.
He gives them a signal report (always 59) and his zone number 08, e.g. "59 08."
He puts in his computer log: their callsign, the 59 report and their zone:

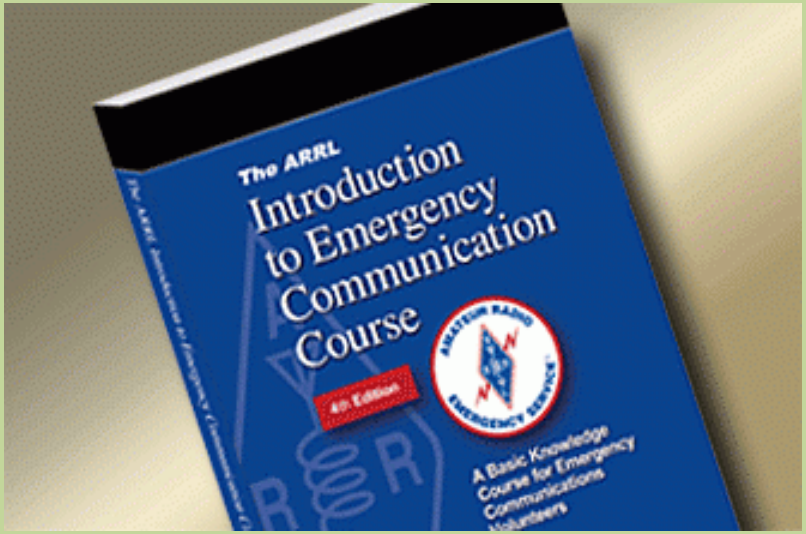

UA3RAW Tambov, RUSSIA (59 16)
UC7A = Krasnodarsky, RUSSIA (59 16)
IW5AB = Montecatini, ITALY (59 15)
9A8M = Miholojac, CROATIA (59 15)

…

*But, if Radio Contests don't sound interesting:*

**Find an aspect of Amateur Radio that sounds interesting, or fun, or challenging - and try it.**




**…if you stop enjoying it, take a break or try something else.**

# If you don’t have room for antennas, or radio equipment:

- Does your local radio club have a club station?
- Are there local club members who can use your help maintaining and operating their station?
- Try “Remote” operating like remotehams.com and remotehamradio.com



# In 2014, I setup my station in Washington for remote operation:

- It was “easy”, just a few extra wires!
- I learned a lot about “reliable”, “automatic” and “foolproof.”

But now I can operate from anywhere with a laptop and internet connection.

# Why we need “Remote operating.”

## High-rise living – the Fantasy:

Outside view

Inside view

# Why we need “Remote operating.”

## High-rise living – the Reality:

Outside view

Inside view

# A complete “Remote Operating” setup.
(Internet and power grid not shown.)

N7G US Open Golf  Special Event short.mp4

*But, if Remote Operating doesn't sound interesting:*

**Find an aspect of Amateur Radio that sounds interesting, or fun, or challenging - and try it.**


**SFRC: TWO NEW REPEATERS**

**The 2015 San Francisco 2 Meter FM QSO Party**
*Saturday, August 29th*

**…if you stop enjoying it, take a break or try something else.**

***…and you too will be Radio-Active! Thank You!***