Zero Retries 0098 - by Steve Stroh N8GNJ

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Steve Stroh N8GNJ

Zero Retries 0098

2023-05-12 - Neil's Night - Part 2

[Steve Stroh N8GNJ](#)

May 12, 2023

Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with radio technology.

New address as of 2023-05-04 - **www.zeroretries.org**

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

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Request To Send

By Steve Stroh N8GNJ

Zero Retries is an experiment-in-progress, so I'm not discouraged about very little feedback about Neil's Night. One long time reader commented (paraphrased) "Good start - I'm looking forward to reading the *entire* story."

The Zero Retries 0097 Podcast seemed to be well-received. It was a successful experiment that revealed a number of areas for improvement - primarily that I should use a better microphone and real recording / editing software.

I have an urgent personal trip scheduled for next week and thus it's unlikely that I'll be able to work on Zero Retries, thus Zero Retries 0099 is already queued up for automatic publication.

Have fun at Hamvention 2023 next week! Take lots of photos and videos for the rest of us. I'm particularly interested in Zero Retries Interesting developments from these inside exhibitors:

- AMSAT

- AREDN

- ARISS-USA

- FlexRadio

- Halibut Electronics (SOAR-1)

- HobbyPCB

- JVC Kenwood (the rumored replacement for the TH-D74A)

- K6BP (Bruce Perens / HamOpen.org, and)

- Libre Space Foundation

- Preppcomm (I'm a fan of their MMX Multi-Band Morse Code Transceiver)

- QRP Labs

- TAPR (of course!)

- West Mountain Radio (great 12 volt power products)

And a few outdoor (flea market area) exhibitors:

- Central Michigan Emergency Network (lots of data networking) - 7240-7241

- Herman Munster

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  Memorial Radio Club (I'm curious...) - 7982-7983
- Mercury Systems (curious what *they're* doing in the Flea Market) - 8025-8027

- North Texas Microwave Society - 8121-8124

Overall, the Flea Market looks nearly sold out with lots of clubs.

/ Steve N8GNJ

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Thought Experiment - Neil's Night - Part 2

By Steve Stroh N8GNJ

One of my most profound joys is to have conversations with people much brighter, more experienced, and more talented than I am. Such conversations often lodge in my mind, and are brought forward by other conversations or experiences in a synthesis of combined thoughts. This idea / story is an example of that.

This is a thought experiment (a specialty of Zero Retries, where I air out, rather than self-censor some of my "irrationally exuberant" ideas) about creating an annual event on July 20th to:

- *Commemorate, via Amateur Radio, the anniversary of humanity's first steps on the Moon in 1969;*

- *Encourage Amateur Radio Earth Moon Earth (EME; "Moonbounce") communications especially to those that haven't tried it;*

- *Expose the fun of Amateur Radio to the public and especially techies (hopefully, young techies) by staying up late on a summer evening pointing antennas (and computers) at the Moon.*

Continued from Zero Retries 0097 - Neil's Night - Part 1.

Update from Part 1

In Part 1 I referenced both <u>JT4</u> and <u>JT65</u> modes for operating EME. Upon further study, the intended use of JT4 is

> … EME on the microwave bands, 2.3 GHz and above.

My current vision for Neil's night is to use Amateur Radio VHF / UHF bands - primarily the 50, 144, 440, and 1200 MHz bands. Among other considerations, antennas for those bands are easier to build (and more forgiving of mistakes), and inexpensive Software Defined Receivers perform well on the VHF and UHF bands. Thus, the JT4 mode is (for the moment) out of scope for Neil's Night, and from this point, only JT65 will be discussed.

Also, *I* mistakenly added dashes when referring to the WSJT-X *modes*. While the primary name - WSJT-X does include a dash, the individual modes do not. Thus, *JT65* is correct; *JT-65* is not. Part 1 has been updated to the correct naming.

Subtext - Public Perception of Amateur Radio as Irrelevant

That Amateur Radio has become increasingly irrelevant (all but unknown) to the general public has been a theme of Zero Retries <u>since its beginning</u>. Thus as I wrote Part 1, the issue of the relevance of Amateur Radio to the public was forefront in my mind… but I didn't mention that in Part 1. Thus, mentally add this section to what you know from Part 1.

In the full article (that is published after this serialization), this section will be incorporated early in the article.

If Amateur Radio is to survive (retain its semi-exclusive allocations of spectrum), it has to be perceived as relevant *in this era* - not mere nostalgia for a hobbyist activity with a century of history. Dr. Karl Meinzer DJ4ZC

<u>2</u>
said so well:

> Ultimately, amateur radio must prove that it is useful for society.

A thorough discussion of how best for Amateur Radio to prove that it *is* useful to society is beyond the scope of this article.

One approach — grass roots demonstrations of Amateur Radio, is effective because such activities can be numerous, diverse, tailored for local situations, and inexpensive. Potentially, demonstrations could scale. Examples:

- <u>Amateur Radio on the International Space Station (ARISS)</u>

- Parks on the Air (POTA) / Summits on the Air (SOTA)

- ARRL Field Day / Winter Field Day

- Amateur Radio exhibits at science museums such as Hall of Science Amateur Radio Club at the New York Halll of Science in Flushing, New York

- Temporary exhibits at local events such as county fairs, etc.

While Neil's Night is one more grass roots demonstration of Amateur Radio, it's unique because it involves, well…. *the Moon! Bouncing radio signals off The Moon!*

And that, as they used to say in the advertising business, is "a good hook" - an idea that attracts one's attention, and thus worth considering.

Later in the article, I'll explain why those other grass roots demonstrations aren't quite compatible with what Neil's Night could accomplish.

Confluence of Influences that led to Neil's Night

This section is another "I should have included this earlier" explanation of all the disparate ideas and influences that coalesced in my mind that led to the idea of Neil's Night. Admittedly it's tough to follow the rationale of Neil's Night without knowing these influences. Thus, mentally add this section to what you know from Part 1. In the full article (that is published after this serialization), this section will be incorporated early in the article.

These are the ideas that, combined, inspired my idea of Neil's Night:

- Amateur Radio needs to be perceived by the public as being relevant in this era.

- Open Source Satellite Networked Ground Station (SatNOGS) and TinyGS (open source ground station network for research satellites using LoRa technology) have shown that techie (not necessarily Amateur Radio Operators) could build receive-only systems for space-based communications.

- With WSJT-X JT65 mode, Earth Moon Earth communications can be accomplished with a modest Amateur Radio station, especially when "Big Dish" EME stations are involved with their very high performance transmitters and receivers.

- My friend's excitement and technical achievement of their own EME system.

- The potential to showcase Amateur Radio's unique capabilities to the public by operating EME in a public place.

- The example of Yuri's Night as an annual event commemorating humanity's first spaceflight.

- There is a "radio technology" component of the Moon landings, and it's an Amateur Radio tradition to celebrate achievements in radio technology history (such as International Marconi Day) by using Amateur Radio in some way.

- The first Moon landing was July 20th, 1969, and the 20th of July seems like a great Summer

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  evening to have some fun showing off Amateur Radio by bouncing radio signals off the Moon.

Yuri's Night

A few years ago a friend invited me to attend Yuri's Night at the Museum of Flight in Seattle, Washington. Until my friend's invitation, I was completely unaware of the existence of Yuri's Night, which is observed annually on April 12th, commemorating the flight of the first human in space, Yuri Gagarin. Yuri's Night is now observed in a number of countries:

> **Yuri's Night - The World Space Party**
>
> Launching parties around the world every year on or around April 12th, in commemoration of Yuri Gagarin becoming the first human to venture into space on April 12, 1961, and the inaugural launch of the first Space Shuttle on April 12, 1981. We use space to bring the world together, to empower the greatest parts of who we are, and give vision to where we are going.

Why not *Neil's* Night?

It's always seemed odd to me that we (as a technological society) don't make a bigger deal of the anniversary of humanity's first steps on the Moon on July 20th, 1969 by the crew of Apollo 11 - Neil Armstrong and Buzz Aldrin.

For us Amateur Radio Operators, or at least me, in addition to getting to (and from) the Moon, it's always been an amazing accomplishment that we were able to communicate realtime during the Lunar mission directly between Eagle (the Lunar Lander) and Earth.

Thus, I propose that Neil's Night, every July 20th, is a celebration of humanity's first steps on the Moon in a manner unique to Amateur Radio - demonstrating Earth Moon Earth (EME) communications in public, to the public.

The elevator pitch for Neil's Night would be something like:

On Neil's Night (every July 20th, anniversary of the first Moon landing), Amateur Radio Operators have fun bouncing radio signals off the moon, and showing the public how much fun they're having.

Bumper sticker version:

Neil's Night
Amateur Radio celebrates humanity reaching the Moon - every July 20th!

Why do Neil's Night… *at night*?

- July 20th is mid-summer in the Northern hemisphere, so it may well be hot during the day and more comfortable after dark.

- Through 2030, July 20th will only occurs on a Saturday in 2024 and 2030, and on Sunday only in 2025. It's possible for working parents to bring kids in the evening, but not during the day.

- It's easier to see the Moon to manually aim the antenna.

- Kids enjoy an excuse to be out after dark (with parental permission and supervision of course). Being out after dark is kind of fun for adults too.

- Flashlights (see simulations, below) work better at night.

Making Neil's Night Accessible to the Public

In the Northern Hemisphere, mid-July is usually moderate Summer weather, so it's an ideal time to conduct Neil's Night activities outdoors.

The primary purpose of Neil's Night activities is to expose the public to Amateur Radio and its unique capabilities in a fun way - bouncing radio signals off the moon (Earth Moon Earth communications - EME).

Thus Neil's Night demonstrations should be accessible (and understandable) by the public. For example, posters would help explain EME communications. Another example would be a fun and easily understandable simulation of EME communications using flashlights and a beachball:

- Simulation 1 - Using Morse Code (example, transmit MOONBOUNCE), shine a bright flashlight (high power LED) at a beachball (held by a person) 200 feet away. In response to the first message, the person holding the beachball transmits a return message (NO CHEESE HERE) using a typical flashlight. Note that the "beachball" flashlight can be seen relatively easily.

  > This represents the Apollo communications system - high powered transmitters (and very sensitive receivers) on Earth, and a low power transmitter and a receiver on the Moon.

- Simulation 2 - Using Morse Code (example, transmit MOONBOUNCE), shine a typical flashlight at the beachball. Note that not much light is being reflected back by the beachball.

  > This represents EME using a low power radio transmitter.

- Simulation 3 - Using Morse Code (example, transmit MOONBOUNCE), shine the bright flashlight at the beachball. Note that the beachball can be more seen more clearly.

  > This represents EME using a high power radio transmitter.

- Simulation 4 - Using Morse Code (example, transmit MOONBOUNCE), shine the bright flashlight at the beachball. Rotate the beachball to the section with the reflective patch. Note that reflected light on the patch can be seen very clearly (compared to the reflection from side of the beachball without the reflector).

  > This represents the Lunar Laser Ranging Experiment where Apollo astronauts placed mirror systems on the Moon for rangefinding experiments using Earth-based lasers.

The primary element of Neil's Night activities is a spirit of fun and experimentation.

Neil's Night venues

Ideally, each Neil's Night station would be in an open area accessible to the public. Example - a parking lot with good visibility to the Moon as it rises in the sky - no tall buildings in the way. The public should be able to walk up to the Neil's Night station(s) and see them in operation. In addition to operators for the equipment, there should be guest chairs for those really interested in the details of operating EME and at least a few "docents" to answer questions from the public about the equipment and EME operation and Amateur Radio. A handout (or perhaps a prominent Quick Response (QR) code should be available for those that want to follow up to learn more about Amateur Radio.

Neil's Night Station Classes

Because full EME operation is only possible for Amateur Radio Operators, but Neil's Night has the potential for promotion of Amateur Radio amongst those not (currently) involved in Amateur Radio, I propose three classes of Neil's Night station:

- **Big Dishes (specialized facility)**

    - Big Dish stations can leverage (focused) higher transmit power and more sensitive receive capability for the benefit of modest EME stations including receive-only stations.

    - For Neil's Night operations, the Big Dish stations publish a schedule for their operations, including frequencies that they will use.

    - There aren't many Big Dish stations, so it should be relatively simple for them to coordinate schedules and frequencies to not interfere with each other and maximize the opportunities for modest and receive-only stations.

- **Receive-only stations - ease of entry**

    - *A receive-only JT65 station is speculative on my part. It requires further research (or further development) on this statement:*
      … use timed sequences of alternating transmission and reception.
      It seems to me that a receive-only option for JT65 should exist, should be possible… but the structure of a JT65 communications may require transmit capability as well as receive. See the detailed discussion of JT65 below.

    - Inexpensive and easy to build receive-only stations are possible… feasible because the Big Dishes can transmit strong signals which would be easier to receive using modest equipment.

    - Because of the modest cost and overall ease of construction, a receive-only station(s) would be an ideal activity for science museums, makerspaces, Amateur Radio clubs, technical colleges, etc. Building and testing the equipment, software, integration could all be done in advance and at modest cost. Because a receive-only station does not require a (complicated) transmitter

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      (Amateur Radio license required), and there is a published "recipe" to follow (similar to SatNOGS and TinyGS), building a receive-only Neil's Night station is well within the ability of an average techie(s)

- **Modest Stations**

    - Modest stations would be built and operated by Amateur Radio Operators — typically an Amateur Radio club.

    - Modest stations would transmit EME using ahigh(er) power using high quality transmitters and receivers. For example, there are a lot of <u>Icom IC-9700</u> radios out there that can easily transmit 75 watts (440 MHz) / 100 watts (144 MHz). By Neil's Night 2023, there will also be at least a few brand new <u>Icom IC-905</u> VHF / UHF / microwave radios <u>in hands of Amateur Radio Operators</u>.

    - Modest stations would probably use commercially manufactured satellite antennas and automatic azimuth / elevation tracking systems; perhaps even portable dish antennas.

    - As Amateur Radio Operators, such stations would reasonably be expected to work through exposure limits and engineer the station accordingly, such as putting up a temporary tower to avoid the possibility of someone walking in front of a directional antenna from a high power transmitter.

WSJT-X JT65 Mode - The Secret Sauce of Neil's Night

The fundamental technology that makes Neil's Night feasible - for the receive-only and modest stations to have any chance of working EME, is <u>JT65</u>, one of the many weak signal data modes that are part of the <u>WSJT-X suite</u>. As I understand it, JT65 transmits slowly, transmits redundant information, and incorporates Forward Error Correction (FEC) so that even very weak and/or corrupted received signals can be recovered from "below the noise threshold". The WSJT-X modes can maintain communications below the threshold of usable Continuous Wave (CW) communications.

<u>WSJT-X Documentation - 8.7 Tips for EME</u>

> JT4, JT65, and Q65 offer **Message Averaging** — the summation of subsequent transmissions that convey the same message — to enable decodes at signal-to-noise ratios several dB below the threshold for single transmissions. JT4 and JT65 also allow **Deep Search** decoding, in which the decoder hypothesizes messages containing known or previously decoded callsigns and tests them for reliability using a correlation algorithm. JT65 and Q65 offer *a priori* (AP) decoding, which takes advantage of naturally accumulating information during a QSO.

WSJT-X modes have <u>modest requirements</u> - a reasonable (in the 2020s…) computer, an audio interface between computer and radio, a radio capable of Single Sideband (SSB) operation, and a stable timebase to set the computer's clock to +/- 1 second of Universal

Time. For Neil's Night operations (not connected to broadband Internet), it's likely that an inexpensive Global Navigation Satellite System (GNSS) receiver connected to the computer via USB would provide the required time accuracy.

Of particular interest for Neil's Night operations, JT65 supports up to 13 characters beyond the required information of a JT65 transmission. WSJT-X Documentation - 7.2. Free-text Messages:

> Users often add some friendly chit-chat at the end of a QSO. Free-format messages such as "TNX ROBERT 73" or "5W VERT 73 GL" are supported, up to a maximum of 13 characters, including spaces. In general you should avoid the character / in free-text messages, as the program may then try to interpret your construction as part of a compound callsign. It should be obvious that the JT4, JT9, and JT65 protocols are not designed or well suited for extensive conversations or rag-chewing.

NEILS NIGHT is eleven characters - two characters to spare.

WSJT-X also supports automatic logging. WSJT-X Documentation - 11. Logging:

> A basic logging facility in *WSJT-X* saves QSO information to files named `wsjtx.log` (in comma-separated text format) and `wsjtx_log.adi` (in standard ADIF format). These files can be imported directly into other programs (such as spreadsheets and popular logging programs).

Logging is useful to potentially provide for possible certificates of participation, which is discussed later in the article.

As mentioned previously, WSJT-X debuted in 2005, thus it is a mature software package with a development team and in regular use by thousands of users. It's likely that Neil's Night activities can be accommodated with the existing features of WSJT-X.

To be continued in Zero Retries 0099, scheduled for publication 2023-05-19.

Update - Neil's Night - Part 3

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Mostly DIY RF

Mostly DIY RF is subtitled Hardware for Hardware-Defined Amateur Radio. It's an interesting electronic store of useful items when you're building Amateur Radio units. An example is Dual-Gate MOSFETs:

> With large-scale integration, their use in industry has declined, and there are now no through-hole versions available on the market. There are, though, some surface-mount devices still produced, but understandably amateurs are reluctant to use them. These little half-inch breakout-boards might make experiments and home brewing with dual-gates a bit easier.

I spotted a banner ad for Mostly DIY RF on the SolderSmoke blog. There's no hint of who is behind Mostly DIY RF other than they apparently live in Portland, Oregon, USA, but kudos to whoever they are for offering a unique set of products supporting experimentation in Amateur Radio!

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Feedback Loop

Comments:

Thank you Ria N2RJ and Oliver for commenting on Zero Retries 0097.

Thank you Ren Roderick, Alexander, DL4NO, and K7IP for commenting on Zero Retries 0079 Podcast.

Email:

Anonymous - *Just wanted to encourage the podcast! Your passion for Zero Retries topics comes out in a very different way in spoken form. I quite enjoyed it. +1 to the short length. Big fan of short, digestible content.*

Larry Gadallah NM7A - *Just to follow up on the EME topic, some portion of EME can be credited to the early days of the Cold War and the US desire to understand and characterize various Soviet radars, while being unable to get close enough to them to do so. I did a bit of digging and found this interesting, previously classified document that goes into quite a bit of*

detail on the subject of monitoring Soviet radars by listening to their reflections from the moon:
https://nsarchive2.gwu.edu/NSAEBB/NSAEBB479/docs/EBB-Moon11.pdf

Your comments and feedback are *greatly* appreciated, all!

If you provide feedback via email, I may excerpt your feedback or include it in full. Unless you specifically grant me permission to include your name, I won't do so. Feedback may be lightly edited for clarity.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out **Join the Fun on Amateur Radio** for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing *Thanks* to:

- Tina Stroh KD7WSF for, well, *everything!*

- **Pseudostaffers** that write about about "Zero Retries Interesting" items on their blogs that I don't spot:

    - Dan Romanchik KB6NU

    - Jeff Davis KE9V

- **Newsletters** that regularly feature Zero Retries Interesting content:

    - Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.

    - Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC.

    - TAPR Packet Status Register has been published continuously since 1982.

    - Other Substack Amateur Radio newsletters recommended by Zero Retries.

- **YouTube channels** that regularly feature Zero Retries Interesting content:

    - HB9BLA Wireless by Andreas Spiess HB9BLA

    - KM6LYW Radio by Craig Lamparter KM6LYW (home of the DigiPi project)

    - Modern Ham by Billy Penley KN4MKB

    - Tech Minds by Matthew Miller M0DQW

- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join ~~100~~ ~~200~~ ~~300~~ ~~400~~ *~~500~~* ~~600~~ ~~700~~ *800+* other readers:

Please tell your friends and co-conspirators about Zero Retries — just click:

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Leave a comment

If you're a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

Zero Retries / N8GNJ on Mastodon

Email issues of Zero Retries are "instrumented" by Substack to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- SuperPacket blog — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*

- N8GNJ blog — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA.

2023-05-12

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1
For you young 'uns, Herman Munster was a famous television character.

2
EME operation wasn't sufficiently challenging for DJ4ZC; he decided to try EVE - Earth-*Venus*-Earth - and succeeded.

3
In the Northern Hemisphere…

4
Especially now that in the US, RF Exposure limits must be calculated and observed…

2 Likes

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