Zero Retries 0115

zeroretries.org/p/zero-retries-0115

Steve Stroh N8GNJ, Kay Savetz K6KJN

Share this post

Zero Retries 0115

www.zeroretries.org

Discover more from Zero Retries

An independent newsletter about technological innovation in Amateur Radio, promoting Amateur Radio as (literally) a license to experiment with and learn about radio technology.

2023-09-08 - My Dad's NOT ALLOWED to push this button!, One Year Update on DLARC, Amateur Radio GEO Payload for the Americas - Update 2023-08, 5 GHz 10 watt Power Amplifier

Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology. Now in its third year of publication, with 900+ subscribers.

About Zero Retries

Steve Stroh N8GNJ, Editor

Jack Stroh, Late Night Assistant Editor Emeritus

In this issue:

Web version of this issue - https://www.zeroretries.org/p/zero-retries-0115

Request To Send

Editorial by Steve Stroh N8GNJ

Wedding Update

The wedding of our daughter Merideth Stroh KK7BKI and Max Pepper on 2023-09-03 was *wonderful!* One of the better quotes from a guest is that it was the most “Portlandish” wedding they’ve ever attended, and that was a goal of Merideth and Max. The most fun of the evening was that the newlyweds were completely surprised with a helicopter departure from the wedding venue, and a brief aerial tour of downtown Portland before landing and limo transport to their honeymoon hotel.

Hardware Modems - How Far We’ve Come

I have a search running on eBay for all things Packet Radio, and recently a MFJ 2400 bps adapter board came up. This was an add-on board for MFJ TNCs (that were based on the TAPR TNC-2 design) that added a 2400 bps modem. It’s a big board, almost as big as the TNC’s board and it struck me (for the nth time) how far we’ve come that this sort of hardware is no longer needed now that we have fast and powerful processors that can keep up with fast ADCs (Analog to Digital Converters) and DACs (Digital to Analog Converters). 2400 bps never caught on in Amateur Radio Packet Radio, mostly because the modest increase in speed (never quite 2x 1200 bps) didn’t really justify the extra cost of the add-on board, and thus, there weren’t many 2400 bps stations to communicate with.

Zero Retries Podcast Isn’t Dead / Forgotten

Producing the few test editions of the Zero Retries Podcast was fun and interesting and I do intend to resume creating podcasts. But it has been a busy Summer, and I have too much respect for Zero Retries readers to just “throw together” an ad-hoc stream of consciousness and call it a podcast. A podcast (that I consider worth listening to and will be reasonably proud of) takes a surprising amount of time to produce, especially distilling an issue of Zero Retries down to a few… and the *right*… talking points. When I have time to do that, it’s a fun process, and seems to be well received.

Since my last update on podcasts, I’ve determined that Substack isn’t capable of subdividing an email newsletter like Zero Retries beyond “Paid Subscribers” or “All Subscribers”. Thus my previous plan to create a Podcast-only newsletter out of the existing Zero Retries subscribers isn’t viable. (I’m not going to divide my efforts and create an entirely new newsletter in Substack.)

When I do resume Zero Retries podcasts, I will create them as before, but unlike before, I will not send out a podcast email to all Zero Retries subscribers. I’ll just note that there is a new podcast available at <link>” in a regular issue of Zero Retries. I think that balances the interests of those who do like the podcast with those that didn’t sign up to be “spammed” with a podcast.

I just became aware of a neat trick to more easily keep up with interesting YouTube channels instead of relying on the YouTube algorithm. Just add the YouTube channel's URL into your RSS feed reader and then new videos will show up as a new item in your RSS feeds. I've now done so for the Amateur Radio YouTube channels I follow and I'm now seeing a lot more Amateur Radio content than I was previously aware of, and I'll see it a lot faster. In my main YouTube feed (Home), the more obscure Amateur Radio YouTube channels were apparently getting crowded out by the more popular YouTube channels and thus I was never seeing the more obscure Amateur Radio content unless I browsed each subscribed channel.

In my RSS feed reader, I prepend each YouTube feed with "YT " so that all the YouTube videos are grouped together. I'm unlikely to watch any more hours of YouTube video - there's only so many hours in the day for passive media consumption.

Two (Apparent) Passings (?)

Digital Communications Conference (DCC) - As previously discussed in Zero Retries, it's conspicuous that it's now mid-September and there hasn't been *any* mention of DCC 2023 on the TAPR website. Thus it's hard to conclude anything other than the DCC, under TAPR's stewardship, is no more.

CQ Magazine - Another conspicuous silence is that CQ Magazine's electronic edition has published reliably on the first of each month. I'm currently a subscriber to the electronic edition and as of publication day, it's now the *eighth* day of the month and still no September CQ posted, and no status update on their website, where the posted current issue is August, 2023.

C'mon folks… just *call it, publicly,* so everyone can move on instead of wondering.

Leave a comment

Share

My Dad's NOT ALLOWED to push this button!

By Steve Stroh N8GNJ

This video is an amusing take on the quest of an adult son and mature father to become licensed Amateur Radio Operators together. Both are highly technical; Jeff Geerling (now KF0MYB) is a Software Engineer and YouTube creator with 541k subscribers and nearly 400 well-produced videos. Jeff's Dad, Joe Geerling (now KF0MYJ) is a Radio Station Broadcast Engineer.

The funniest part of the video is when KF0MYB says:

> To me, radio is a lot of black magic.

Generally, KF0MYB expresses a lot of befuddlement about what he sees as the nuances, technology, and traditions of Amateur Radio… all of which he feels he needs to sort out in his mind before he can even make a first contact with his dad using their new portable radios.

But what KF0MYB doesn't understand is just how quickly he will be able to begin mastering and (it's my guess…) *contributing* to Amateur Radio because his software background will enable him to participate at the bleeding edge of radio technology - ***Software** Defined Radio*! I imagine great things from KF0MYB after he really gets going with GNU Radio and Amateur Radio in general *on a software / networking level*. I'm guessing that it won't be long before there is a corner of KF0MYB's new office devoted to radio, likely remoted via his (nearly) 1 Gbps Internet connection.

Leave a comment

Share

One Year Update on Digital Library of Amateur Radio & Communications (DLARC)

By Kay Savetz K6KJN

I was in touch with K6KJN about the "manuals project" (see ZR > BEACON below) and they followed up that brief update with this update on DLARC in general. I've been continually gratified to see obscure Amateur Radio material that I've collected, and shipped to DLARC, become digitized and made available online. - Editor.

It's been one year since I began as curator of Internet Archive's Digital Library of Amateur Radio & Communications. In that time, it has grown from an idea — a concept funded by the ARDC — to a collection of more than 90,000 items related to amateur radio, shortwave, amateur TV, and related communications. The collection now includes ham radio club newsletters from around the globe, magazines and journals, amateur radio podcasts, manuals and catalogs, and more.

From the start, the radio community has embraced the idea. Glenn Hauser gave permission for DLARC to archive his DX Listening Digest and other publications. Hap Holly digitized lost episodes of his RAIN Report radio program. Cal Poly Amateur Radioclub sent several file cabinets worth of material. People have ventured into musty attics and basements to find radio publications that have never been available online before, such as Florida Skip and Capitol Hill Monitor. The families of several Silent Keys were happy to have their family members' documents scanned and made available to the world.

DLARC is growing to be an amazing collection of radio information. I'm having a great time and meeting amazing people in the process. Plans for the next year include scanning four pallets of manuals from the Manuals Plus collection. I'll continue to reach out to ham radio clubs to ask to include their newsletters in the archive. (When clubs have old issues on paper that need to be digitized, we scan them at no cost to the club.) In the next year I hope to do more with archiving open-source amateur radio software, and to announce partnerships with radio museums. We're in the process of adding transcriptions of all the audio and video material, so they'll be full-text searchable like the newsletters.

If you have questions about the project or material to contribute, please contact me at kay@archive.org.

Leave a comment

Share

Amateur Radio GEO Payload for the Americas - Update 2023-09

By Steve Stroh N8GNJ

One of a series of updates with my thoughts on how to get an Amateur Radio presence in Geosynchronous Earth Orbit (GEO) above the Western Hemisphere.

I've received no feedback to date on my most recent article on this subject. There were no objections, likely from being ignored / unnoticed. Notably I wasn't accused of causing any harm to any behind-the-scenes negotiations or discussions.

To acknowledge an obvious observation… yes, of course my efforts here in Zero Retries are amateurish. I have never been involved in Amateur Radio satellite activity other than as a cheerleader of AMSAT and ARISS and Earth-Moon-Earth experimentation. *Anything* I do in this activity *will* be amateurish, under-experienced, with no credentials or credibility. But, again, I'm not aware of (and I've *looked*) anyone else stepping up to do anything like this, or (to date) help me. Thus… nothing I do on this personal project can hurt a non-existent activity.

This update is some further thought about reaching out to an operator of GEO satellites for North and South America about the possibility of incorporating an Amateur Radio payload on their next GEO satellite for the Western Hemisphere. I found a list of companies on Wikipedia, and a few that seem worth investigating:

- Telesat (Canada)
- Mexsat (Mexico)

- DirecTV (USA)
- Intelsat (Belgium / USA)
- Inmarsat / Viasat (UK / USA)

My thinking about Telesat and Mexsat is that given their respective ownership and service areas, they may be receptive to the idea of an Amateur Radio payload that would offer independent communications to encourage “higher tech” Amateur Radio activity (as part of STEM education).

DirecTV might be receptive because of their relationship with AT&T and its involvement in FirstNET emergency communications, and DirecTV might welcome some positive press coverage about involvement with Amateur Radio and a tie-in with Amateur Radio’s well known capabilities for emergency communications, such as

GEO - it’s still important! See how we’re helping 21st century Ham Radio!

Intelsat and Inmarsat (now a subsidiary of Viasat) are both behemoths in the GEO satellite business and might be receptive as one of their primary services - broadband Internet - has now been severely disrupted by Starlink. Inmarsat used to have a significant business in non-terrestrial voice, but the vastly increased voice capability of Iridium has impacted that business. Like DirecTV, both might welcome some positive press about their GEO satellite capabilities

Lastly, there are several non-defense US Government agencies that operate satellites in GEO, including NOAA, and NASA (though NASA’s satellites are hard to find info on other than TDRSS). Beyond the Advanced Communications Technology Satellite (ACTS), NASA still seems interested in advanced communications via satellite. The possibility of working with NASA is perhaps most promising because of its long history with Amateur Radio on the International Space Station (ARISS).

Future research:

- Investigate if the satellite system (RINCON Research’s AstroSDR) that was offered for the previous GEO project is still on offer.
- Consider attending AMSAT-NA’s 2023 conference (2023-10-20 and 21) in Irving, Texas. Perhaps there is some rabble to be roused there.
- Consider attending the industry conference that’s most directly involved with GEO satellites - SATELLITE 2024 (2024-03-18 thru 21) in Washington DC. It would be a stretch to attend this conference as it would be pretty high cost and I doubt that Zero Retries would count as Press to the conference operators.

- I still think there's a case to be made for emergency communications and / or carefully controlled use of the remaining two US Department of Defense FLTSATCOM satellites in GEO above the Americas. Of the eight FLTSATCOM satellites launched in the late 1980s, with design lifetimes of less than a decade, two (FLTSATCOM 7 and 8) are still operational. At least some of the FLTSATCOM capability is (as I understand it) simple bent pipe (new term - non-regenerative) transponders with no ground infrastructure (other than management) required, thus they're ideal for use in emergencies (even better than Starlink).

  FLTSATCOM 7 and 8 are now 20+ years beyond their design lifetime, thus it seems feasible that they will be decommissioned from regular use and that role migrated to the Ultra High Frequency Follow On (UFO) satellites that are the designated replacement for FLTSATCOM.

Leave a comment

Share

5 GHz 10 watt Power Amplifier

By Steve Stroh N8GNJ

A reasonably priced and reasonable power 5 GHz power amplifier is one of the elements needed for ground stations / user terminals for an Amateur Radio GEO Payload for the Americas.

One of the issues identified in the previous attempt at an Amateur Radio GEO satellite for the Americas was that the preferred uplink (satellite receive) frequency is the Amateur Radio 5 GHz band. Ground and user stations would require reasonable transmit power (multiple watts) on 5 GHz because the system designers perceived that most Amateur Radio Operators would prefer to use smaller dish antennas with corresponding minimal gain… and it's a long way (~36,000 km, ~22,300 miles) to GEO.

Since there weren't aren't any off-the-shelf power amplifiers available for 5 GHz for Amateur Radio, designing such an amplifier and persuading someone to manufacture it was another "fertile area of development" for the project.

Thus I found this interesting article by Andrew McColm VK3FS - 5.7 GHz 10w PA from SG Lab that seems a good solution to this issue.

> SG Laboratory recently released a 5.7 GHz 10w PA. This amplifier has been developed and produced for industrial use but is matched well for the 6cm amateur band. It is based on the latest GaN power transistor from Cree / Wolfspeed. If you have plans for 6cm, this PA would complement most transverters.
>
> …
>
> My 250mW 6cm Kuhne transverter drives the amp via a 13dB attenuator. Inside the box you'll see a 28v DC to DC converter. You'll find these online for around $30 AUD. Keep an eye out on my Youtube channel for a video too.d on the top of the case.
>
> A final note… the price of this amp as at July 2023 is 384 Euro +10 Euro for shipping.
>
> Hristiyan LZ5HP has a 25w version in design too.

So… 5 GHz power amplifier at a reasonable price - ***check!***

Icom IC-905 Includes 5 GHz Radio

Since the previous work on a Amateur Radio GEO Payload for the Americas, the Icom IC-905 has debuted, with integrated 5 GHz subsystem, with transmit power on 5 GHz of 2 watts. That would seem to be an ideal radio for using this 5 GHz power amplifier.

Kuhne Electronic 5 GHz Power Amplifier - and More!

Always curious, I did a quick web search for 5 GHz Amateur Radio power amplifiers, I found Kuhne Electronic MKU PA 6CM-4W A, GaAs FET Power Amplifier - 100 mW in, 4 W out, €830 (including VAT).

It's encouraging that Kuhne Electronic supports Amateur Radio so well, including a line of products specifically for QO-100 / Es'Hail-2 including the Oscar Phase 4 Up-Converter. So it's *possible* that Kuhne Electronic might be willing to develop a similar package for Amateur Radio GEO Payload for the Americas. Perhaps even develop such a package for an OEM North America to sell and support.

Leave a comment

Share

ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

Cover Plaque Award Vote for Article on FreeDV in QST 2023-09

ARRL awards a Cover Plaque award to one article in each issue of QST. If you're an ARRL member and thus receiving QST, I recommend voting for the article "Digital Voice the Easy Way" by Ira Brodsky KC9TC. The article was a good primer on using FreeDV on HF and was one of the few Zero Retries Interesting articles published in QST this year. The nomination is at http://www.arrl.org/cover-plaque-poll, and voting is open until 2023-09-26. If KC9TC's article is the winner, perhaps the QST Editorial Staff will take note and publish more Zero Retries Interesting material.

VK5DGR's FreeDV Update - March - August 2023

Speaking of FreeDV, David Rowe VK5DGR recently posted a report on his work this year on FreeDV. I was particularly interested to read that VK5DGR is actively doing work involving FreeDATA, which uses the robust waveform developed for FreeDV for data transport.

> In April and May I developed the datac4 and datac13 raw data modes to support FreeDATA, that Simon immediately integrated and is now in daily use. The mode is capable of sending data down to around -8dB on poor quality HF channels, which has resulted in messages being sent all over the world using HF Radio and no other infrastructure. Here is a map of FreeDATA users. Here is some more technical information on the FreeDV raw data modes that have been developed.

Now that we have efficient, good, low-bitrate voice CODECs and pretty good, reliable data transports such as FreeDATA and soon 9600 bps with integral Forward Error Correction (FEC) in MMDVM-TNC (I continue to recommend it be called G4KLX)… It seems we're on the cusp of being able to arbitrarily mix and match data and digital voice on the same infrastructure… just like we do on the Internet and high speed microwave data networks.

Commissioner Anna Gomez Finally Brings FCC to Full Capability

This week, Anna Gomez was confirmed as a Commissioner of the US Federal Communications Commission, bringing the FCC up to five Commissioners. The FCC will now be able to tackle issues that had been previously deadlocked between two conservative Commissioners and two progressive Commissioners.

The appointment of Commissioner Gomez is unlikely to affect any Amateur Radio issues with the FCC as there is a considerable amount of high-priority work queued up.

FCC Seeks Nominations for Membership on Technological Advisory Council

Speaking of the FCC staffing up…

> The Federal Communications Commission (FCC or Commission) is seeking nominations for membership on the Technological Advisory Council (TAC or Council). Following consultation with the General Services Administration, the Commission anticipates renewing the charter of the TAC, for a period of two (2) years starting on or about September 7, 2023. The Commission anticipates that the first meeting of the TAC will be in December 2023.
>
> …
>
> The TAC will provide technical advice to the Commission and make recommendations on the issues and questions presented to it. It is anticipated that Chairwoman Jessica Rosenworcel will ask the TAC to evaluate several issues, including: continued efforts at looking beyond 5G advanced as 6G begins to develop so as to facilitate U.S. leadership; studying advanced spectrum sharing techniques, including the implementation of artificial intelligence and machine learning to improve the utilization and administration of spectrum; and other emerging technologies.
>
> …
>
> All nominations should be submitted to the Commission as soon as possible, but no later than September 22, 2023. All nominations, including the requisite statements listed below, should be submitted by e-mail to TAC@fcc.gov.

There have been a number of Amateur Radio Operators as members of the TAC over the years.

Update on DLARC Manual Sorting at Internet Archive

From Kay Savetz K6KJN, Internet Archive's Program Manager, Special Collections (for Digital Library of Amateur Radio & Communications):

> Thanks for announcing the DLARC manual sorting work day on the Zero Retries mailing list. Your announcement delivered at least two people to the project. The announcement was also widely spread to several other Bay Area ham radio mailing lists. (I didn't try to track how people learned about it.) We ended up with about 15 volunteers throughout the day — some were able to help for a couple of hours, and some were there all day. We sorted though 15 pallets of manuals, looking for material that was related to radio. In the end we had four pallets of radio- and radio-adjacent manuals. They will being shipped off to one of the Internet Archive's scanning centers soon.
>
> The material was from Manuals Plus, a company that specialized in selling manuals for technical equipment. We sorted though literally tons of manuals for chemistry lab gear, aviation, aerospace, and military equipment, laser gadgets, and more. Some of the manuals were so obscure and obtuse that even after a minute of paging through them, the reader would have no idea what the manual was for.
>
> I'll let you know when the first batch of manuals from this project are online. I expect it will take a few months.

WINTNC Still Being Improved

Since announcing WINTNC 2.0 on 2023-08-16 which updated it to be usable on recent versions of Windows, Jon Welch G7JJF has released several additional updates - 2.01, 2.02, and 2.03. New features include:

> - Telnet Client
> - ANSI Driver
> - Adds a callsign / password protected telnet server to connect to your node over the internet
> - Allow the additional selection of COM ports 10 to 20
> - Made screen width configurable with a max size of 70 rows x 132 cols
> - Tidied up port configuration dialog box
> - Added RAW Port mode to allow communications with a non-KISS mode TNC

D-Star via TEVEL Satellites

I love stories like this about Amateur Radio experiments that attempt out-of-the-ordinary things, like this satellite activity by Florian Wolters DF2ET via the recently launched TEVEL Amateur Radio satellites which feature transponders rather than single frequency FM repeaters. It wouldn't have occurred to me to try D-Star via satellite, but hey, why not?

The Electromagnetic Spectrum per XKCD:

Spectrum geek that I am, somehow I missed this gem, originally published in 2007.

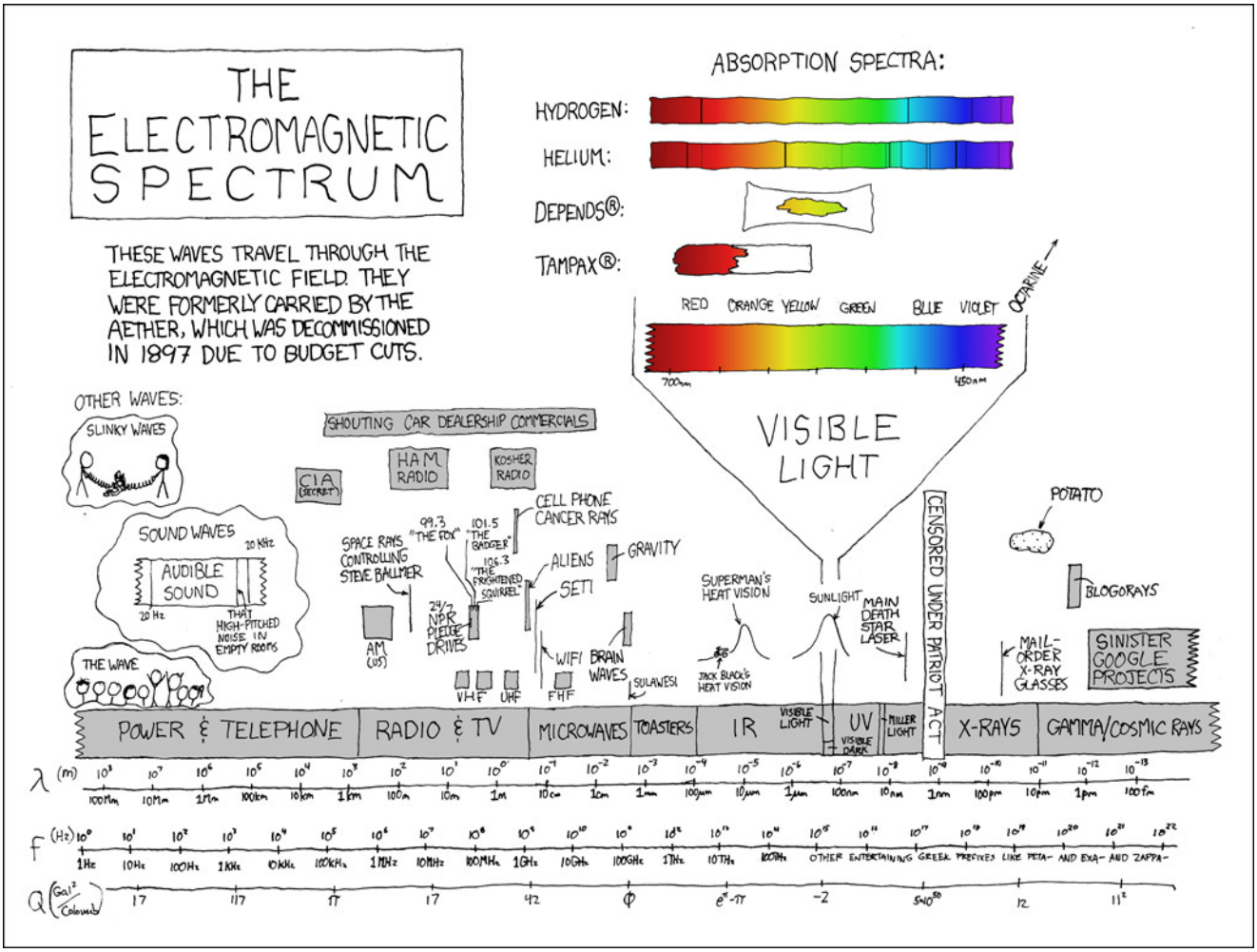

Image courtesy of XKCD.com - #273, 2007-06-06

I love that HAM RADIO (and KOSHER RADIO) gets a mention 😀

Leave a comment

Share

Zero Retries Poll

Loading...

This poll will remain open through 2023-09-15.

Feedback Loop

Comments from Zero Retries 0114.

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!*
- **Founding Members who generously support Zero Retries financially:**
  Founding Member 0000 - Steven Davidson K3FZT
  Founding Member 0001 - Chris Osburn KD7DVD
  Founding Member 0002 - Don Rotolo N2IRZ
  Founding Member 0003 - William Arcand W1WRA
  Founding Member 0004 - Prefers to remain anonymous
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR: Zero Retries Administrivia - Activating Payment Options.

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.

- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your QRZ page (or other web presence) and include a link:

  https://www.zeroretries.org

  If you'd like to financially support Zero Retries, becoming a paid subscriber is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
  Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- Dan Romanchik KB6NU mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.

- Jeff Davis KE9V also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.

- 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. It's a *must-read-now* for me!

- RTL-SDR Blog - *Excellent* coverage of Software Defined Radio units.

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

- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels 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~~ *900*+ other readers:

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

Share Zero Retries

Offering **feedback or comments** for Zero Retries is equally easy — just click:

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.

2023-09-08

If you'd like to reuse an article in this issue, for example for club or other newsletters, just ask. Please provide credit for the content to me and any other authors.

All excerpts from other authors or organizations, including images, are intended to be fair use.

Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I *owe* them from *way* back).