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November 1, 2019

RE: WT Docket No. 16-239

The summary claim of the NYU argument presented states:

*"NYU argues that dynamic compression techniques effectively encrypt or encode communications in violation of the rule because they allow only two linked stations to complete a transmission without error, and thus have the practical effect of obscuring messages for anyone other than the sender and receiver."*

**This has already been proven false** with multiple examples of texts monitored within the single system specifically addressed by the Petitioners, without error. Absolutes like this are very tough to maintain in a statistical universe. How many proofs are required to disprove a theorem? (Obviously, just one.)

ARQ techniques (presumably what is meant by "linked stations") are clearly present in lower-level modulation techniques *specifically approved* by the FCC since 1995. These are but one method to reduce the effects of error inherent in physical medium transmissions, and their algorithms still cannot prove absolute zero error. Another method to asymptotically reduce error that can be utilized to prove the summary claim false, is diversity receiving, in particular spatial or antenna diversity, easily accomplished by volunteers.<sup>1 2 3 4</sup> Experimental evidence in the case of WINLINK transmissions has already been furnished, as noted below, that this is effective at providing monitoring copy. The test experiment involved an extremely large WINLINK message, the entire Farewell Address of George Washington.

As further shown in the documentation below, dynamic compression has been in use in the amateur radio service since at least 1993, and likely before. It is hard to explain why something in use for 26 years would have escaped the notice of the FCC, were it truly a violation.

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1 IEEE (1954): <https://ieeexplore.ieee.org/document/4051767>

2 [https://en.wikipedia.org/wiki/Diversity\\_scheme](https://en.wikipedia.org/wiki/Diversity_scheme)


3 Sachdeva and Sharma, <https://pdfs.semanticscholar.org/0c90/182132ba22587281f65081228bc99f20fc8a.pdf>

4 Tse, [https://web.stanford.edu/~dntse/Chapters\\_PDF/Fundamentals\\_Wireless\\_Communication\\_chapter3.pdf](https://web.stanford.edu/~dntse/Chapters_PDF/Fundamentals_Wireless_Communication_chapter3.pdf) see particularly Section 3.3.1 Receive Diversity discussing the effects of receiver diversity on reception of fading signals, and eq. 3.71, demonstrating that for every doubling of the antennas, a 3dB gain is achieved.

# INCONVENIENT OBSERVATIONS2

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Responses to claims and assertions made by Rappaport, Fitzgerald, Castle and Marcus. PETITION FOR DECLARATORY RULING [https://ecfsapi.fcc.gov/file/10242392005642/NYU Wireless Petition for Declaratory Ruling - 10.24.19.pdf](https://ecfsapi.fcc.gov/file/10242392005642/NYU%20Wireless%20Petition%20for%20Declaratory%20Ruling%20-%2010.24.19.pdf)

<b>Text from Rappaport et al</b>  [Footnotes were embedded into the text as my word processor is not capable of maintaining two separate sets of footnotes.] Spacing has been adjusted as required for clarity of comparative discussion.	<b>Reply comments</b> <b>Gordon L. Gibby MD KX4Z</b>  Please note that I am not a member of the Winlink Development Team.
<p><b>I. SECTION 97.113(a)(4) PROHIBITS THE TRANSMISSION OF EFFECTIVELY ENCRYPTED OR ENCODED MESSAGES, INCLUDING MESSAGES THAT CANNOT BE READILY DECODED OVER-THE-AIR FOR TRUE MEANING.</b></p> <p>Section 97.113(a)(4) explicitly prohibits the transmission of “messages encoded for the purpose of obscuring their meaning, except as otherwise provided [in the rules].” [47 C.F.R. § 97.113(a)(4)] Importantly, the Commission has described Section 97.113(a)(4) as a “prohibition on encryption.” [Don Rolph Petition for Rulemaking to Amend Part 97 of the Commission’s Rules Governing the Amateur Radio Service to Provide for Encrypted Communications, Order, 28 FCC Rcd 13366, ¶ 4 (WTB 2013) (DA 13-1918) (“2013 Order”).] Over time, the Commission has implemented and revised Section 97.113(a)(4) so that “the amateur service rules . . . conform to the language of the international <i>Radio Regulations</i>.”</p> <p>[Id. n.3; see also Amendment of Part 97 of the Commission’s Rules to Implement Certain World Radio Conference 2003 Final Acts, Order, 21 FCC Rcd 278 (WTB 2006) (DA 06-79) (revising Section 97.113(a)(4) “to conform to the current language of Radio Regulations Article 25.2A”); see also Letter from Michael J. Marcus, Sc.D, F-IEEE, Director, Marcus</p>	 <p><b>ITU SPONSORED WINLINK GATEWAYS</b></p> <p>To realize how <b>completely mistaken</b> are the premises and claims of Rappaport Fitzgerald, Castle and Marcus, at the very outset of their Petition, <u>one only has to observe the group who formulates the very International Regulations on which Rappaport et al. base their complaint -- <b>the ITU</b> -- and discover that it is that very organization which is trumpeting their active support of amateur radio WINLINK in the Americas to provide additional emergency</u></p>

Spectrum Solutions, LLC, to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 16-239, RM-11831, and RM-11828, at 2 (Oct. 13, 2019) (discussing relationship between FCC amateur rules and ITU Radio Regulations) ("Marcus Ex Parte").]

The international *Radio Regulations* "prohibit[] amateur stations from transmitting messages in codes or ciphers intended to obscure the meaning thereof." [Amendment of the Amateur Service Rules to Clarify Use of CLOVER, G-TOR, and PacTOR Digital Codes, Order, 10 FCC Rcd 11044, n.6 (WTB 1995) (DA 95-2106) ("PacTOR 1 Order").]

communications systems:

*Read it in the ITU's own words:*

How ITU is strengthening emergency telecommunications in the Americas, By Miguel Alcaine, Representative of the ITU Area Office in Tegucigalpa, Honduras <sup>5</sup>

This article, straight from the ITU web site, explains how the ITU has worked

"to set up an alternative telecommunication system for use in times of emergencies. The system does not rely on conventional means of communication such as the Internet, but rather on amateur radio systems.

#### **The benefits of Winlink**

The alternative telecommunications system used is known as Winlink, a worldwide email service that uses radio pathways and is capable of operating completely without the Internet."

Far from demanding the abolition of WINLINK and their advanced compressed data transfers, the ITU is helping to set up and FUND more of these systems! One wonders how this escaped the notice of the Petitioner.

Additional ITU-sponsored stations are planned for the Caribbean.<sup>6</sup> **This must be an interesting problem for Rappaport, Fitzgerald, Castle and Marcus' thesis.**

NATION

ITU WINLINK

<sup>5</sup> ITU: <https://news.itu.int/how-itu-is-strengthening-emergency-telecommunications-in-the-americas/>

<sup>6</sup> Burton: [https://winlink.org/content/more\\_itu\\_gateways\\_coming\\_caribbean\\_islands](https://winlink.org/content/more_itu_gateways_coming_caribbean_islands)

		STATION
	Honduras	HR0COP Sept 10 2018
	Costa Rica	TI0BCR Oct 9 2018
	Dominican Republic	HI8COE Nov 6 2018
	Guatemala	TG0CND Nov 8 2018
<p><b>How can Rappaport, Fitzgerald, Castle and Marcus make such an enormous error? To cite as their proof of illegality, the very group championing the system they attack? Their consistent tactic is to erroneously paraphrase and twist the clear meaning of FCC regulations which quite plainly forbid the intentional obscuration of messages--which clearly the ITU does not see in WINLINK.</b></p> <p><b>The sign of this tactic is any mention of some previously-unknown new flavor of "encryption" that miraculously requires <u>no secret key whatsoever</u> and while being "encryption<sup>7</sup>," <u>has no actual security</u>. And then to claim this manufactured concept (made from whole cloth) is "illegal."</b></p>		
Therefore, decades-long rule interpretations have stressed the need for open, transparent communications in the amateur bands.	<p><b>Fundamental Petition Philosophical Flaw</b></p> <p>While this is a <u>laudable and important concept</u> (for which I personally have actually put in a hundred hours of coding<sup>8</sup> and actual experimentation<sup>9</sup>) <u>the authors not only fundamentally misunderstand the 1995 decisions of the FCC, but even appear to wish to elevate this single concept above the actual requirements</u></p>	

- 7 Wikipedia: Keys are required for real encryption. <https://en.wikipedia.org/wiki/Encryption> Reading an encrypted message without possessing the key is known as "breaking" the encryption and is a noteworthy event.
- 8 Gibby: <https://ecfsapi.fcc.gov/file/10830048730238/FreeSoftwareToReadWINLINK.pdf> Development of C routines to strip out headers etc and read WINLINK messages.
- 9 Gibby: <https://ecfsapi.fcc.gov/file/109191626613689/InconvenientTruths.pdf> Hours of experimental data capture to prove capture of WINLINK pactor messages over 900 miles apart from the actual two stations engaged in the transfer; monitoring from a Newberry Florida **bus-stop**.

	<p><u>for identification, which are much more simple, but even more so, far above the goals for the Amateur Radio Service itself, expressed in 97.1.</u></p> <p>The Amateur Radio Service had as one of its goals a sandbox for experimentation, personal growth, and advanced training of an ever larger reservoir of citizens. Not an obsessively limited, rigidly constrained, hemmed-in, repetitive area only for the rehearsal of techniques developed three-score years ago. (Even though I personally quite enjoy CW!)</p> <p><b>THIS IS THE FUNDAMENTAL FLAW IN THEIR ENTIRE PETITION, besides their vast technical confusion, that is addressed point by point herein. A desire to elevate this one laudable -- but obsessional-- goal above and even to the exclusion of other more important goals.</b></p>
<p>For years, certain amateur licensees have skirted these requirements, [See Letter from Ari Q. Fitzgerald, Counsel to New York University, to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 16-239, RM-11831, RM-11828, RM-11759, and RM-11708, Attachment at 4-6 (Oct. 8, 2019) (discussing "long standing problems" in the Amateur Radio Service); Reply Comments of Theodore S. Rappaport, N9NB, PS Docket No. 17-344, WT Docket No. 16-239, RM-11708, and RM-11306, at 9-10 (highlighting the longstanding efforts of certain amateur licensees to effectively encrypt communications and advocacy to permit effectively encrypted communications).] sending and receiving communications over amateur bands using communications modes that incorporate dynamic compression techniques</p>	<p><u>Fallacious Accusation.</u> It would seem that Rappaport, Fitzgerald, Castle and Marcus would have us add the International Telecommunication Union to those "skirting these requirements!" Their only hope is to convince a sufficient number that decades-old text compression using publicly disclosed, ancient techniques, is somehow difficult to deconstruct, while still maintaining that they are experts in these fields.</p> <p><b>Actual FCC Part 97 makes no regulation of any kind against any text compression, whether considered "static" or "dynamic."</b> The word "compression" is not even utilized. Nor are the words "true meaning."</p> <p>[Defer discussion of their technical error of ascribing dynamic compression to low-level techniques, when it is actually accomplished at Layer 7, as covered elsewhere.]</p>

## TWENTY SIX YEARS OF VIOLATIONS?

I am not at all certain that Rappaport, Fitzgerald, Castle and Marcus are aware of **just how LONG** amateur radio licensees have been utilizing both ARQ and dynamic data compression (sliding window) LZHUF (actions which they claim should be illegal).

**The answer is at least TWENTY-SIX YEARS, and for at least TWO YEARS before the FCC issued its 1995 decision defining the requirements for new data technique public specification.<sup>10</sup>**

The FCC would have been well aware of the combination of ARQ (in AX.25<sup>11</sup>, 1200 baud at VHF, 300 baud at HF; in G-TOR<sup>12</sup>, in PACTOR-1<sup>13</sup> and in CLOVER<sup>14</sup>) and dynamic data compression in LZHUF in FBB at least by 1993.<sup>15</sup> BBS's were all the rage back then! Furthermore it appears that the WORLI BBS system also had the ability to handle FBB compressed messages<sup>16</sup> -- and others may well also, as further research may show. I was simply busy in my medical career, and all this passed me by.

The FCC made no proscription against this combination in its famous decision rewriting 97.309(a).

**This powerful, advanced radio technique has been in use ever since, for 26 years.** And then suddenly, it has become a threat to the national security, to amateur radio's future, and illegal?

*Who knew?*

10 FCC: <https://docs.fcc.gov/public/attachments/DA-95-2106A1.pdf>

11 AX.25 Protocol: <https://www.tapr.org/pdf/AX25.2.2.pdf> Earlier version 2.0 released in 1984.

12 ARRL: <http://www.arrl.org/g-tor>

13 ARRL: <http://www.arrl.org/pactor>

14 ARRL: <http://www.arrl.org/clover>

15 Personal communication, John Wiseman. Brad Davidson KA9LCF remembers running an early version in 1987 and that it had compression on forwarding even then! (Personal communication, Brad Davidson.)

16 WORLI BBS Specification; see page 22. [http://noapra.org/applications/snos/WORLI-BBS\\_spec\\_12oct1998.pdf](http://noapra.org/applications/snos/WORLI-BBS_spec_12oct1998.pdf)

	<p>The incredible data compression advances since 1949 are quite confusing. For the reader:</p> <p><b>My Attempt To Organize Lossless Data Compression Advances<sup>17</sup></b></p> <table><tr><td>Developer</td><td>Date</td><td>Property</td></tr><tr><td>Shannon-Faso</td><td>1949</td><td>1st modern</td></tr><tr><td>Huffman</td><td>1951</td><td>Reversed creation direction of table; more efficient</td></tr><tr><td>Lempel-Ziv LZ77</td><td>1978</td><td>Sliding Window (dynamic)</td></tr><tr><td>Vitter</td><td>1987</td><td>One pass - sliding window (dynamic)</td></tr><tr><td><b>Yoshizaki - LZHUF</b></td><td><b>1988</b></td><td><b>FAST! dynamic (sliding window), and public domain</b></td></tr><tr><td>Gailly &amp; Adler gzip</td><td>1992</td><td>Patent-free sliding window compression based on LZ77 / Huffman; slower but compacts well<sup>18</sup></td></tr><tr><td>Seward bzip2</td><td>1996</td><td>Patent-free, considerably more complicated multi-stage compression system, slow but excellent compression.<sup>19</sup></td></tr></table>	Developer	Date	Property	Shannon-Faso	1949	1st modern	Huffman	1951	Reversed creation direction of table; more efficient	Lempel-Ziv LZ77	1978	Sliding Window (dynamic)	Vitter	1987	One pass - sliding window (dynamic)	<b>Yoshizaki - LZHUF</b>	<b>1988</b>	<b>FAST! dynamic (sliding window), and public domain</b>	Gailly & Adler gzip	1992	Patent-free sliding window compression based on LZ77 / Huffman; slower but compacts well <sup>18</sup>	Seward bzip2	1996	Patent-free, considerably more complicated multi-stage compression system, slow but excellent compression. <sup>19</sup>
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<p>["Compression" is a technique that reduces the number of bits needed to send a particular message, which conserves bandwidth and improves spectrum efficiency. See Theodore S. Rappaport, WIRELESS COMMUNICATIONS: PRINCIPLES AND PRACTICE, Ch. 7 (1st ed. 1996). Almost all of today's Amateur Radio Service data modes use static compression with publicly known static compression tables, which allows all Amateur Radio Service licensees to listen to messages over-the-air for true meaning under reasonable propagation conditions. Where static compression is</p>	<p><b><u>Dynamic Compression (Sliding Window): the newly-re-discovered 41-year old Bad Guy</u></b></p> <p>Dynamic compression techniques, sometimes called sliding window techniques, are anything but novel or esoteric -- having existed since Lempel and Ziv's creation of LZ77 (sometimes called LZ1) in 1977.<sup>20</sup> With LZ78, this</p>																								

17 Not being a mathematician, this is my best effort to categorize these advances that quite literally changed the world of hard drives and electronic communication.

18 Wikipedia: <https://en.wikipedia.org/wiki/Gzip>

19 Wikipedia: <https://en.wikipedia.org/wiki/Bzip2>

20 Wikipedia: [https://en.wikipedia.org/wiki/LZ77\\_and\\_LZ78](https://en.wikipedia.org/wiki/LZ77_and_LZ78)

used, a known, fixed, and well-documented mapping of bits is defined for any symbol of the alphabet. By contrast, **dynamic compression** formulates a new, unique compression table each time a message is sent. Each formulated compression table is unique to each individual message. Aspects of the dynamic compression "**key**" are sent as part of the unique message itself and are not known universally. If any bits are lost by an Amateur Radio Service licensee attempting to listen to the message over-the-air, it is virtually impossible for the licensee to understand the message. [emphases added]

development was declared an IEEE milestone in 2004. Vitter developed a one-pass mechanism for such compression in 1987 (32 years ago) published by the Journal of the Association for Computing Machinery.<sup>21</sup>

Progress continued, resulting in the creation of fast-running LZHUF and its availability to amateurs all over the world in 1988.<sup>22</sup>

At least by 1993, amateurs were using dynamic compression (sliding window) LZHUF in FBB, because it was in version 5.15, which was extant in 1993--**two years before the FCC's rewriting of 97.309(a).**<sup>23</sup> .

In the face of these world-renowned compression advances used on virtually every computer and Internet connection in the world, Rappaport, Fitzgerald, Castle and Marcus choose language that appears designed to falsely create the impression of *intentional obfuscation* (that escaped the FCC's notice for 26+ years). In this passage [and elsewhere], they chose the word "*key*," (to suggest an encryption key) and used the word "*encrypt*" in an attempt to make techniques such as Vitter's 32-year old paper or Yoshizaki's 1988 work, a violation to employ on the amateur airwaves.

**But neither Vitter nor Okumura<sup>24</sup> used the word "key" --** instead Vitter described a "table" 145 times, and in his paper, he never used the word "encrypt" at all. "Table" is the traditional term for compression dictionaries.

Thus they use *language* when *facts* don't work.

True Experts know that compression is NOT encryption, and the ARRL itself made this

21 Vitter: <http://www.ittc.ku.edu/~jsv/Papers/Vit87.jacmACMversion.pdf>

22 Okumura: <https://oku.edu.mie-u.ac.jp/~okumura/compression/history.html>

23 Personal communication, John Wiseman. Brad Davidson KA9LCF remembers running an early version in 1987 and that it had compression on forwarding even then! (Personal communication, Brad Davidson.)

24 My best source for the history of the rapidly developing LZ series.



	<p>painstakingly clear in a recent filing.<sup>25</sup> Thus Rappaport, Fitzgerald, Castle and Marcus not only strongly disagree with me, but also with the Winlink Development Team, Phil Karn<sup>26</sup>, and the Amateur Radio Relay League.</p> <p><u>Static Compression?</u></p> <p>Rappaport, Fitzgerald, Castle and Marcus provide no objective proof for their claim that "Almost all of today's Amateur Radio Service data modes use static compression...."<sup>27</sup> Whether true or not, it is irrelevant! Nor do they explain how, with "reasonable propagation conditions" this allows for their chosen level of ability to read "for true meaning" -- and why <i>my successful capture of multiple messages</i> was not "reading for true meaning."</p> <p>If you really lose the signal long enough....SSB, WINLINK, CW....<i>you lost the signal</i>. You're going to miss a part of the message, no matter what your technique or protocol! There will always be signal losses long enough to outlast any practical FEC. Static compression, no compression, dynamic compression --- doesn't matter if you really lose the signal, you're going to miss some portion. Not sure why this is so elusive to the Petitioners.</p>
Therefore, dynamic compression provides a "moving target" that makes it extremely difficult – <b>if not virtually impossible</b> – for an	<u>The Virtually Impossible</u>

25 ARRL: "These commenters appear to misconstrue the difference between prohibited "encryption" of messages – which generally is understood to refer to a process intended to ensure that only the addressed (authorized) parties can access the message -- and the encoding of messages that converts data into a standard format so that it can be digitally transmitted and received and, in some instances, compress the data for efficient transmission. Pursuant to the Commission's Rules, any Radio Amateur operator is authorized to transmit data using an authorized digital code. 26 When doing so, an operator can "use any technique whose technical characteristics have been documented publicly ... for the purpose of facilitating communications."<sup>27</sup> [https://ecfsapi.fcc.gov/file/10918259487629/ARRL 16-239%2C RM-11759%2C RM-11828%2C RM-11831.pdf](https://ecfsapi.fcc.gov/file/10918259487629/ARRL%2016-239%20RM-11759%20RM-11828%20RM-11831.pdf)

26 Karn: "As we all know, true encryption is and should remain prohibited on the amateur bands. For this reason, "encryption" is a loaded word among radio amateurs, and I object to Rappaport repeatedly pushing this emotional button with the misleading term "effectively encrypted". He uses this term because he knows that the communications at issue do not meet the formal definition of encryption. " <https://ecfsapi.fcc.gov/file/10513525129724/rm11831-rebuttal-to-rappaport.pdf>

27 Discussing DATA (as opposed to voice): At least the following utilize formal sliding window LZHUF or similar: WINLINK, PAT, BPQ, FBB, D-RATS. I'm not completely familiar with which techniques use static Huffman compression: Pactor modems can natively utilize Huffman compression (two available: one for English, one for German); JT65 is said to use compression; see: <http://wb8nut.com/digital/>. One could argue that techniques with vari-coding (Morse Code, PSK31, etc) are a "form" of static compression, and the Petitioners apparently count these, but that is a weak argument.

Amateur Radio Service licensee attempting to listen to the message to decompress the message for true meaning.]  
[emphasis added]

and, by extension, effectively **encrypt** or encode the communications.

[Winlink is an example of a system that has contravened the Commission's requirements. Winlink is a "worldwide radio email service" that relies on amateur radio bands. See Winlink Global Radio Email, News, <https://www.winlink.org/> (Sept. 11, 2019).  
[emphases added]

Most amazingly, Rappaport, Fitzgerald, Castle and Marcus make the eye-opening claim that reading WINLINK messages is "**extremely difficult--if not virtually impossible.**" This brings great mirth, since I (and others) have been *doing it rather successfully and publishing the results rather widely* including on the FCC comment site.

Beginning Sept. 3, 2019:

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0903/reconstruct0903-1B.txt>

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0903/reconstruct0903-3B.txt>

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0906/reconstruct0906b.txt> (from Peter Helfert work)

Captures over 900 miles:

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0908/reconstruct0908N5TW%232-time1555.txt>

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0910/email%231.txt>

<https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0910/email%232.txt>

[https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0910/email%233\(trucated\).txt](https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/0910/email%233(trucated).txt) (error partway through file)

I have also captured PACTOR email using a simple raspberry pi 4 and a sound card using some of the newer software created by Peter Helfert, while on vacation in a travel trailer in the Smokey Mountains. So much for the virtually impossible!

*This is so easy to do now, that the most significant hurdle is actually the paucity of any*

	<p><u>WINLINK PACTOR signals with which to test.</u></p> <p>Anyone with suitable gear can do this now. There is even a free commercial application which makes it almost (but not quite) "point and click." It should be required demonstration in computer science courses to demonstrate how foolish one would be, to believe that compression equals encryption!</p>
<p>Winlink utilizes certain communications modes that compress email communications to send them more efficiently over amateur radio bands (e.g., PacTOR, PACTOR 2, PACTOR 3, PACTOR 4, WINMOR, ARDOP, and VARA). Aside from PacTOR, which was open-source and approved for use by the Commission in 1995, the communications modes have not been publicly documented in a way that allows amateur operators or the public to understand messages sent by the Winlink system over amateur frequencies and are therefore not subject to the Commission's exception that would permit their use. See 47 C.F.R. § 97.309(a)(4) (permitting use of "any technique whose technical characteristics have been documented publicly" and listing PacTOR as an example, but not PACTOR 2, PACTOR 3, PACTOR 4, WINMOR, ARDOP, or VARA); see also <i>PacTOR 1 Order</i> (approving use of open-source PacTOR).</p>	<div style="border: 1px dashed black; padding: 10px;"> <p>Petitioner now moves from <b>application-layer complaints</b>, to complaint over the documentation of advanced lower level <b>techniques</b>.</p> </div> <p>Note: <b>Petitioners err at the start</b> of their discussion of compression at the ISO Layers 1/2 because the WINLINK application layer (Layer 7) <b>turns off ALL such compression at the lower layers</b>. This is another example of the confusion exhibited by the Petitioners.<sup>28</sup></p> <p><b>Regarding Public Documentation</b>  <u>The ARRL attempted to explain for all readers the plain requirements of public documentation of new techniques.</u><sup>29</sup> A plethora of digital techniques are in current usage in amateur; free software FLDGI properly handles scores. The ARRL even hosts technical documentation of multiple techniques.<sup>30</sup></p>

28 It is also curious that the Petitioners do not appear concerned by the several other systems which have profitably used both dynamic compression and ARQ, some of them at least since 1993. These include (but are not limited to) FBB, FLDGI/FLMSG, WINLINK, D-RATS, and BPQ. With proper software and hardware, any of these systems should be monitorable by any station.

29 ARRL: "The use of digital transmission techniques in the Amateur Service has been considered by the Commission on multiple occasions and the rules are explicit: new digital techniques must be documented publicly.<sup>28</sup> The condition of public documentation generally has been accomplished by publication on the Web where the documentation is available to everyone. For example, the League itself long has hosted a number of such documents on its website. 29 The Commission approvingly noted several of the descriptions published on the League's site when it adopted this rule in 1995. This established clear examples of accepted descriptions that today continue to serve as valid references for documentation of new techniques.<sup>30</sup> " [https://ecfsapi.fcc.gov/file/10918259487629/ARRL 16-239%2C RM-11759%2C RM-11828%2C RM-11831.pdf](https://ecfsapi.fcc.gov/file/10918259487629/ARRL%2016-239%2C%20RM-11759%2C%20RM-11828%2C%20RM-11831.pdf)

30 ARRL: "This is a one-stop Web site for technical characteristics called for in FCC rules § 97.309(a)(4), which reads: (4) An amateur station transmitting a RTTY or data emission using a digital code specified in this paragraph may use any technique whose technical characteristics have been documented publicly, such as CLOVER, G-TOR, or PacTOR, for the purpose of facilitating communications.

While software has apparently been developed very recently to decode Winlink communications when sent using different PACTOR modes, the software's efficacy and availability is unclear when applied to existing PACTOR-capable modems.

Petitioner now moves back to  
**application-layer complaints.**

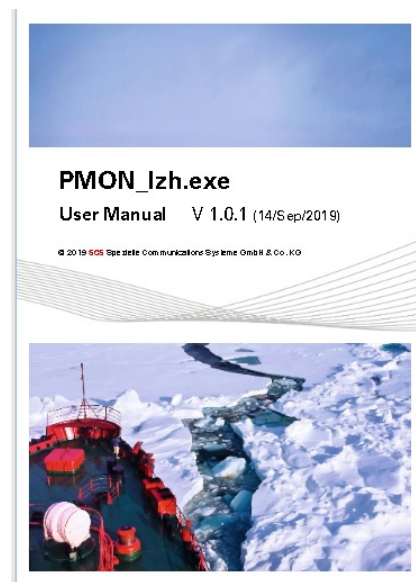
Rappaport, Fitzgerald, Castle and Marcus even seem unclear on where to FIND all of the recently created advances for reading WINLINK messages so I'll provide them here:

One source is to simply download free commercial executable code from the SCS Pactor download site.

- [https://www.p4dragon.com/download/pmon\\_lzh\\_v\\_1\\_0\\_7.zip](https://www.p4dragon.com/download/pmon_lzh_v_1_0_7.zip) (For Windows, with a Dragon modem)

and

- <https://www.scs-ptc.com/en/PMON.html> (for Raspberry Pi with a sound card)



*SCS User Manual for free software to monitor WINLINK using a Dragon Modem -- this software was utilized in some published experiments.*

- Another source is to find amateur-created

Documentation should be adequate to (a) recognize the technique or protocol when observed on the air, (b) determine call signs of stations in communication and read the content of the transmissions. " The list includes 3 versions of PACTOR as well as WINMOR and many other techniques. <http://www.arrl.org/technical-characteristics> Apparently Rappaport et al., find the ARRL's documentation insufficient.

	<p>code on the North Florida Amateur Radio Club web site:  <a href="https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/">https://www.qsl.net/nf4rc/Tech/RaspberryPiWinlinkDecoder/</a> where the authors could also find practice messages with which to gain expertise.</p> <p>And of course, these noted experts could just <i>write it for themselves!</i> (Assuming the possession of a Pactor modem.) All the required information is available in source<sup>31</sup> and explanatory form<sup>32</sup> from 1999 web servers, and I've reviewed this extensively in an FCC filing.<sup>33</sup> Since ALL SCS modems include commands to read PACTOR, the authors could also provide any desired software for older models as well -- simply leverage the application layer software I've provided.</p> <p>Note: Loading these free pieces of software and starting the programs takes a LOT LESS WORK than the extraordinary UHF/VHF/ millimeter wave efforts of positioning a station properly to capture a side lobe or the main beam of a microwave signal, proposed by these experts to overcome the application of their own arguments to VHF/UHF/millimeter waves -- a situation they oddly find totally acceptable.</p>
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31 Still extant ftp server mirrors of the f6fbb ftp server: <ftp://ftp.lip6.fr/pub/hamradio/f6fbb/> ; <ftp://ftp.funet.fi/pub/ham/packet/bbs/f6fbb/> .

32 Click to "FBB forwarding protocol" on the public site <http://www.f6fbb.org/>

33 Gibby: <https://ecfsapi.fcc.gov/file/10808597817982/ExParteCommunicationAug8.pdf>

<p>If any bits or letters are missed or corrupted during the reception – as would be expected under HF propagation – the message cannot be realistically decoded. See Letter from Hans-Peter Helfert, DL6MAA, to Scot Stone, Federal Communications Commission, WT Docket No. 16-239, RM-11831, at 3 (Oct. 22, 2019) (“Decoding will be performed properly until there is a gap in the input data stream. Missing data in the received data stream thus . . . leads to an abort of decoding.”) (“Helfert <i>Ex Parte</i>”).</p>	<p><u>Rappaport et al. can't figure out how LZHUF performs</u></p> <p>Their misunderstanding of the actual outcome of missing bits of input data is again obvious. In previous filings I have shown that anyone can at their own desk computer can see that material prior to losses are easily read.<sup>34</sup> I have also demonstrated that diversity reception is a very good cure for any difficulties<sup>35</sup> --- just as it is in contest officiating and in other radio reception.<sup>36</sup></p>
<p>Furthermore, no decoding has been developed for other Winlink communications modes (<i>i.e.</i>, VARA, ARDOP, and WINMOR).]</p>	<p>Rappaport, Fitzgerald, Castle and Marcus incorrectly claim that "no decoding has been developed for other Winlink communications modes (<i>i.e.</i>, VARA, ARDOP, and WINMOR)." This is quite confused, and further demonstrates their lack of understanding of (system) consistent application-layer WINLINK software organization. The exact same <code>readcapture.c</code> and <code>lzhufuniv8.c</code> which I provided for their use, free of charge, will perfectly read VARA, ARDOP and WINMOR -- the only part left is for persons so desirous to write a simple routine to use characters from the free tnc routines and merely format into PMON-style lines. This has all been explained before. All of the packet disassembling and decompression is identical for ALL winlink techniques; and the lack of understanding of this portion of the Application Layer (ISO Layer 7) by these authors is surprising.<sup>37</sup></p>

34 Gibby: "ExParte Myths" <https://ecfsapi.fcc.gov/file/10906223525884/ExParteMyths.pdf>

35 Gibby: "Inconvenient Truths" -- see particularly SECTION THREE EXPERIMENTAL RESULTS PROVIDING EVIDENCE THAT THE PROPOSED DIVERSITY RECEIVING SYSTEM WOULD LIKELY RESULT IN SIGNIFICANTLY MORE COMPLETE CAPTURE. This is the first known-to-me experimental proof of the efficacy of simple two-station diversity receiving for conquering fading in the capture of WINLINK messages. Others are surely farther along. <https://ecfsapi.fcc.gov/file/109191626613689/InconvenientTruths.pdf>

36 As early as World War II, diversity receiving was being utilized: War Department Technical Manual TM 11-872A [http://www.tnchistory.org/PressWireless/manuals/prewi\\_frr-3a\\_manual.pdf](http://www.tnchistory.org/PressWireless/manuals/prewi_frr-3a_manual.pdf)

37 Gibby: FreeSoftwareToReadWinlink: <https://ecfsapi.fcc.gov/file/10830048730238/FreeSoftwareToReadWINLINK.pdf>



These amateur licensees combine dynamic compression with Automatic Repeat Request (“ARQ”), which allows only two linked stations to complete a transmission without error. For other amateur licensees who attempt to “hear” a message sent using dynamic compression and ARQ, fading and interference will prevent those licensees from receiving an error-free copy of the message, thus effectively obscuring the dynamic compression key and the messages themselves for anyone other than the two locked stations. Other licensees will thus be unable to reconstruct the decoding and compression scheme and, by extension, unable to decode the message for true meaning. [10 At least two commenters have claimed that Winlink messages may be monitored over-the-air, albeit under **unrealistic, controlled conditions** that do not represent reasonable propagation conditions. See Helfert *Ex Parte* at 3 (“Decoding will be performed properly *until there is a gap in the input data stream.*”) (emphasis added); Comments of Gordon L. Gibby (KX4Z), RM- 11831, at 1 (Apr. 9, 2019) (allegedly demonstrating over-the-air monitoring under highly controlled conditions) (“Gibby Comments”). If the alleged monitoring solutions work as claimed, these commenters should have no objection to the Commission issuing the requested declaratory ruling. [emphasis added]

While one might argue that it is also virtually impossible to monitor point-to-point amateur transmissions in microwave bands if high gain/narrow beam antennas are used in a point-to-point transmission, this can be differentiated from effective encryption because: (1) such point-to-point radio paths are very efficient, have a small impact on other spectrum users, and generally do not cover distances more than a few kilometers; (2) such point-to-point radio paths would occur at UHF frequencies and above, where there is significantly more Amateur Radio Service spectrum than at HF frequencies; and (3) the narrow beamwidths resulting from such antennas may produce some privacy away from the direct line-of-sight path but still allow third parties to monitor for true meaning via radio propagation caused by antenna sidelobes, scattering, moving a receiver into the main beam, or other propagation mechanisms, while also allowing significant decreases in required transmitter power with less interference to other spectrum users in the area.]

### What have they actually tried?

These pessimistic statements suggest their argument is only theoretical, and based on NO experimental data, and doesn't fully encompass how WINLINK, or PAT, or FLDGI/FLMSG, or FBB actually work. The extraordinary weakness of their position is that it appears to have only produced only WORDS<sup>38</sup>, yet refuses to acknowledge actual experimentally developed data proving their theory incorrect--which I have produced in multiple experiments and filings.

- I have observed no statements suggesting trials of any of the provided software.
- No mention of any successes, or any failures -- no comments on the commercial manual on the SCS site.

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[See above discussion comparing this tortuous defense to the ease of loading free software.]

### Specious ARQ Claims Made By Those Who Have Apparently Never Tried Monitoring

Rappaport et al., seem not to understand that all three of the 1995 listed techniques in the rewritten 97.309(a)(4) actually used ARQ! It is obviously acceptable to the FCC! (And in voice form, has been a staple of the National Traffic System for

38 Huggins observed: "Did you notice something very important in all of this? Did you notice how our merry little band of debaters are the only ones to actually came up with solutions of some capability that addressed some of the concerns? We all had a part in this even if you wrote no code as this debate stimulated the various efforts. Is it enough? That varies person to person, but we accomplished a whole lot more than any of the various filings from institutions. " <https://forums.qrz.com/index.php?threads/nyu-files-petition-for-declaratory-ruling-to-clarify-97-113-a-4-of-the-commissions-rules.678105/page-8#post-5240476>

	<p>almost a century.)</p> <p>Rappaport et al. make many claims about <u>how difficult monitoring is</u> and how <u>virtually impossible it is</u> -- but I have actually spent hours DOING IT (see documentation above; once this is demonstrated several times, how many more repetitions are required?).</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>What they claim is so difficult, I have been doing -- and publishing -- for quite some time now.</p> </div> <p><u>Dealing With Fading</u></p> <p>Rappaport et al., correctly point to the difficulties of receiving an advanced technology in the setting of fading conditions -- <b>but without any experimental evidence at all of their own</b>, they completely ignore the experimental evidence that I captured and provided, demonstrating the incredible power of a simple diversity receiving system<sup>39 40</sup>-- possibly even with freely available web SDR receivers --- to capture not only the normal packets, but also the luxury-repeat packets<sup>41</sup> that will often show up. This is a fatal flaw to their argument that such capture is impossible.</p> <p><u>Controlled Conditions?</u></p> <p>Rappaport et al, then make the incredible claim that Winlink message have effectively only been monitored in "unrealistic, controlled conditions that do not represent reasonable propagation conditions." Did they not read the disclosure? Here are photos of the bus-stop 20 meter capture sessions of real WINLINK messages from a station 900 miles away to a DIFFERENT station elsewhere in Newberry Florida:</p>
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39 Gibby: <https://ecfsapi.fcc.gov/file/109191626613689/InconvenientTruths.pdf>

40 The 3 most valuable techniques for dealing with fading are (1) Diversity, (2) Diversity; (3) Diversity. Personal Communication, Phil Karn.

41 Luxury Repeat Packets: The ARQ has a significant advantage to a monitor who has even a slight signal to noise edge over the intended recipient -- the monitor gets to see all the REPEATED PACKETS requested by the intended recipient. I observed this quite often in my own bus-stop tests, but it is apparently not recognized by the Petitioners.

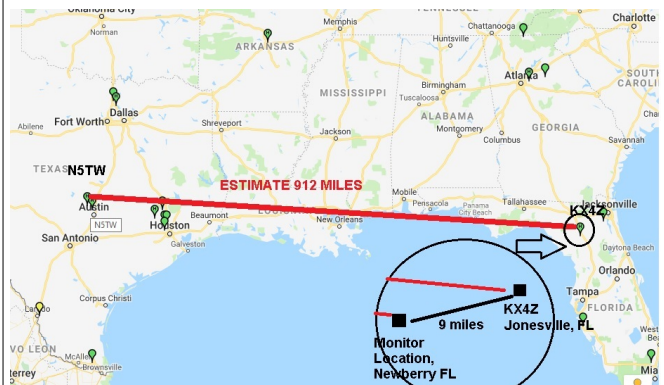




The TRUCK



The Monitoring Station



The 900+ mile path to the intended station -- and

	<p>the Monitoring Station 9 miles away in a hot, sweaty bus stop parking lot.</p> <div data-bbox="820 268 1461 462" style="border: 1px solid black; padding: 10px; text-align: center;"> <p>The only thing unrealistic here was that it was UNREALISTICALLY DIFFICULT due to the HEAT and CONDITIONS and I still succeeded!</p> </div> <p><b>And yes, I *do* object to the goals of Rappaport et al to attempt to rewrite the commonsense meaning of multiple portions of Part 97 to suit their pet goals of taking Amateur Radio back 30 years when the most advanced communications might have been RTTY.</b> The requirements for technical specification of new modes have been forthrightly explained by the ARRL (see above), and that has clearly been accomplished for all Pactor techniques, ARDOP and WINMOR (as well as many other techniques) with published specifications and even talks given at meetings, despite their bold assertions to the contrary. Some of these have even been recreated by commercial adversaries, which was never done for all of the modes explicitly listed by the Commission, a fact that eludes these current Petitioners.</p>
<p>The amateur licensees that rely on dynamic compression techniques have justified the use of these compression techniques by stating that, although they make it virtually impossible to readily decode the communications for true meaning, the compressed messages are not “encoded <i>for the purpose of obscuring their meaning.</i>” [ 47 C.F.R. § 97.113(a)(4) (emphasis added). ] Under this conveniently narrow interpretation of Section 97.113(a)(4), [See Marcus <i>Ex Parte</i> at 1 (describing Part 97 rules as “anachronistic provisions that made sense when they were adopted decades ago <i>but are ambiguous or problematical today</i>”) (emphasis</p>	<p><b><i>Justifications can be offered, but are totally unnecessary.</i></b> Nowhere in Part 97 is there a requirement for persons to <i>justify</i> their choice of communications, or communications advancements that are in keeping with the goals of Part 97.1. Rappaport invents a non-existent justification requirement....<i>again demonstrating their fundamental misunderstanding of the priorities laid out by Part 97.1.</i></p> <p>The justifications for pursuing a portion of</p>

<p>added). ]</p> <p>dynamic compression techniques (and resulting <b>encryption</b> that minimizes openness and transparency and prevents effective self-policing of the amateur bands) are justified and defended as simply a byproduct of an intent to use limited spectrum resources more efficiently. [emphasis added] [See, e.g., Helfert <i>Ex Parte</i> at 2 (The compression techniques “ha[ve] nothing to do with encryption or obfuscation, but only serve[] to reduce the amount of data.”); Gibby Comments at 2 (stating that certain amateur licensees rely on “compression techniques to speed transfer and result precious bandwidth-time utilized”); Comments of SCS, RM-11831, at 2 (Apr. 15, 2019) (discussing how “onboard” and “outboard” compression efficiently utilize shortwave spectrum). ]</p>	<p>amateur radio are often simply PLEASURE.<sup>42</sup> No other justification is required, to pursue DX, ragchews, technical achievements, Worked All States, etc.</p> <p>A Slip Up: here Rappaport et al., falsely claim <b>encryption</b> <i>where none exists</i>. [See text to the left]</p> <p>In the case of advanced techniques pioneered by Jean Paul Roubelat 30+ years ago, and adopted by WINLINK and others 20 years ago, the <b>benefits</b> in terms of 97.1 purposes, are plainly obvious.</p> <p>As previously demonstrated, the "virtually impossible" I -- and others -- have demonstrated in painstaking detail, over and over again.</p>
<p>Despite claims that the relied-upon communications modes are not <i>intended</i> to obscure the meaning of messages, users of these communications modes have publicly acknowledged precisely the opposite. For example, users have stated that the communications modes – and the dynamic compression techniques on which they rely – are used in order “to reduce spectrum use <i>and</i> to <i>enhance privacy</i>.” [ See, e.g., ARRL Maryland-District of Columbia Section, <i>Winlink 2000 Radio-E-mail System Overview</i>, <a href="http://www.arrl-mdc.net/Winlink/MDCWL2KOVwAM.htm">http://www.arrl-mdc.net/Winlink/MDCWL2KOVwAM.htm</a> (Sept. 15, 2019) (emphasis added). ] This public admission demonstrates an intent to “obscure” the messages’ meaning from others who are self-policing the amateur bands, in violation of Section 97.113(a) (4). By linking compression to efficient spectrum use <i>and</i> privacy, the admission also highlights how amateur licensees may easily evade Section 97.113(a)(4)’s prohibition on messages “encoded for the purpose of obscuring their meaning.”</p>	<p><u>Completely Fallacious "Public Admission"</u> Apparently unable to find any better damning evidence, <b>Rappaport is forced to go to a private, non-authoritative 2009 web page from a private user to support a claim against the Winlink Development Team.</b> <i>If legal arguments can be made by citing anything written anywhere on the planet, by any writer, then convictions in court will become far easier to make....</i> Simply find someone who claims what you wish to cite! The page in question provides this footnote:</p> <p>Page last updated OCT 19, 2009 MDCWL2KOVwAM.htm “Windows” operating system and “Notepad” references are trademarks of Microsoft. ARES® is a trademark of the ARRL, Newington, CT © W3YVQ SEP 2005-2009, all rights reserved</p> <p><b>Such a miscarriage of debate should be carefully noted.</b><sup>43</sup></p>

<sup>42</sup> Pure fun is often part of amateur radio. However, even forbidding all normal 3rd party traffic is considered a useful restriction by Ron Kolarik and some other RM-11831 proponents. <https://forums.qrz.com/index.php?threads/nyu-files-petition-for-declaratory-ruling-to-clarify-97-113-a-4-of-the-commissions-rules.678105/page-4#post-5240073>

<p>Without clarification from the Commission that Section 97.113(a)(4) prohibits the transmission of messages that cannot be decoded over-the-air for true meaning under reasonable propagation conditions, amateur licensees will continue to evade the Amateur Radio Service's self-enforcement mechanisms by simply stating <i>another</i> purpose for using technologies that render messages extremely difficult to decode, even with additional software and hardware converters.</p>	
<p>Furthermore, while spectral efficiency has been cited as the reason for relying on many of these communications modes, the actual efficiencies gained do not outweigh the costs associated with eliminating effective self-policing of the amateur bands. The compression techniques are used largely for non-time sensitive applications (<i>e.g.</i>, email), and the time saved can be measured in mere fractions of a second, or a few seconds at most. At the same time, the cost of implementing a static and public compression solution that would allow amateur licensees to intercept and decode messages for true meaning is minimal. Amateur Radio Service licensees already rely on many other published communications modes that use public, static compression,</p> <p>[Examples include JT-65, WSPR, PSK-31, CW, FT-8, and FT-4.]</p> <p>which allows all users and the public to intercept messages over-the-air and decode them for true meaning under reasonable propagation conditions. An entity relying on communications modes that effectively encrypt messages could easily switch out the code that implements dynamic compression techniques for code that implements static compression, and this switch can easily be made through a software update. Therefore,</p>	<p>A fallacious argument that assumes its own conclusion [that Winlink encrypts] but then further bases itself on a false premise.</p> <ol style="list-style-type: none"> <li>1. Completely the opposite of "eliminating effective self-policing," the Winlink Development Team has demonstrated <b>the most objectively proven effective self policing in the history of amateur radio.</b><sup>44</sup></li> <li>2. The authors may be unfamiliar with disaster communications and therefore make the astonishing claim of largely non-time sensitive applications; they also don't understand the exigencies of multiple users trying to make usage of narrow 97.221(b) slivers -- perhaps because they have no actual experience?</li> <li>3. The authors again refuse to admit that successful decoding is now a proven fact.</li> <li>4. The authors continue to falsely claim "effectively encrypted"</li> </ol>

43 Rappaport is not alone in incorrectly utilizing internet sources. NIFM incorrectly takes the Winlink team to task over a slide set that points out WINLINK can accept encrypted text [as could just about any data medium] as "proof", apparently not recognizing this is completely acceptable in SHARES usage of this software, and in fact encryption software is provided to some SHARES participants. See: <https://forums.qrz.com/index.php?threads/nyu-files-petition-for-declaratory-ruling-to-clarify-97-113-a-4-of-the-commissions-rules.678105/page-10#post-5241348> Even Huggins missed that key fact, <https://forums.qrz.com/index.php?threads/nyu-files-petition-for-declaratory-ruling-to-clarify-97-113-a-4-of-the-commissions-rules.678105/page-10#post-5241874> as discussions are often marked by more mis-information than actual fact.

44 Gibby: <https://ecfsapi.fcc.gov/file/10822196770221/ReAnalysisOfWinlinkObjectionableMessages.pdf>

entities using communications modes that effectively encrypt messages could push a simple software update to their users; provide and widely demonstrate a public, static compression method that may be used by the broad Amateur Radio Service community to decode messages for meaning over-the-air under reasonable propagation conditions; and comply with Section 97.113(a)(4)'s openness requirement.

### **One Correct Point!**

It is true that the Winlink Development team -- *if it could get simultaneous adjustments by all other users of the nineteen-year-old FC protocol (there are multiple)* -- could switch out to any other compression system<sup>45</sup> -- even a better dynamic one such as PAT has pioneered<sup>46</sup> .....but since there is nothing wrong with the one Jean Paul Roubelat chose, rather it actually has advantages for openness<sup>47</sup> ....this argument can only succeed if its goal is already assumed.

Rappaport & Marcus might well wish to get into actual software development to achieve their particular goals, and create a superior compression system -- one that is suitable by their criteria as well as that of Dan Planet, who criticized LZHUF (a very fast protocol) for not being quite as compact as bzip2 or gzip.<sup>48</sup>

Perhaps these experts can come up with something that is

1. able to compact more than bzip2 or gzip,
2. faster than LZHUF,
3. able to produce outputs on the fly like LZHUF can,
4. able to work with not just English but all languages,
5. able to handle not just text but all data types well, and includes re-entry points as well.

That would be a welcome development for amateur radio, far more useful than merely writing words.

### Building a volunteer monitoring group?

The petitioners evince a desire to have suitable

45 Helfert points out this just requires actual work: <https://forums.qrz.com/index.php?threads/nyu-files-petition-for-declaratory-ruling-to-clarify-97-113-a-4-of-the-commissions-rules.678105/page-8#post-5240591>

46 Planet: in 2009 Dan Planet urged WINLINK to move to bzip2 or gzip. I suspect Rappaport et al., would not have been pleased. <http://www.danplanet.com/blog/2009/11/09/winlink-1988/>

47 As Peter Helfert has demonstrated, LZHUF not only provides output almost immediately after the beginning of transmission, but it also provides perfect capture of text up until reception loss.

48 Dan Planet: <http://www.danplanet.com/blog/2009/11/09/winlink-1988/>

	<p>volunteer public monitoring of communications within systems such as WINLINK.</p> <p><i>"public, static compression method that may be used by the broad Amateur Radio Service community to decode messages for meaning over-the-air under reasonable propagation conditions"</i></p> <p>This is a worthy goal.</p> <p>However, sober examination of that interest might note that amateur radio <b>assets</b> (gateways and participant stations) suitable for disaster or pleasure communications using the WINLINK system <u>are now quite considerable both worldwide and nationally</u> (as urged by Part 97.1 (a) and (d) ). In order to further their obsession to monitor all of these communications, a practical position might have <i>created a group of motivated volunteers</i>.<sup>49</sup> I am unaware if any such effort has begun in the last two decades.</p> <p>Rather, <b>quite helpful efforts</b> (and much appreciated by me) by amateurs have simply utilized the astonishingly effective WINLINK viewer, which has the very useful property that it doesn't just show messages <i>now</i>, but also allows easy perusal of a 21-day history--- something that the usual physical receiver doesn't provide. I remain unconvinced that the Petitioners can even adequately take advantage of the significant software developments made available for their use, to achieve their stated goals.</p>
	<p style="text-align: center;"><b>Huge Missed Facts</b></p> <p>Those opposed to the advances of Jean-Paul Roubelat and subsequent developers, such as Rappaport et al., and others, often fail to observe key facts about the specific choices made by the FCC in 1995 to use as examples, and the existing amateur radio normal practice context of their language:</p>

<sup>49</sup> Part 97.1(d) urges "Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts. " --the actual development of a body of trained persons.



	<p>1) <b>LZHUF [dynamic, or sliding window, compression] was in usage in FBB at least by 1993</b>, two years before the FCC issued its rewrite of 97.309(a). <sup>50</sup> [Further historical research may well show it much earlier.]</p> <p>2) Thus the FCC would have been aware of the advances dynamic compression before their decision in 1995<sup>51</sup>; further amateurs were known to externally compress and send files via bulletin boards even before that. <sup>52</sup></p> <p>3) AX.25 ("packet") Version 2.0 was released by Terry L. Fox in 1984.<sup>53</sup> AX.25 includes acknowledge-request error correction (ARQ). It has widely been utilized for BBS's and can be utilized both on VHF (1200 baud) and HF (300 baud). Packet BBS systems were at one time extremely popular.</p> <p>4) All three modulation techniques specifically in existence and specifically approved by the FCC in 1995 involve ARQ.</p> <div style="border: 1px solid black; padding: 10px; margin-top: 10px;"> <p>5) With AX.25 ARQ since 1984 , at least three other techniques with ARQ, and FBB LZHUF in 1993 -- the reader recognizes that <b><i>both ARQ and dynamic compression were well used simultaneously by amateurs prior to the 1995 FCC writing.</i></b></p> <p>Layer 2 technologies (G-TOR, Clover, Pactor) did not have dynamic compression.....but the application layer (layer 7) for FBB did -- and if used with any of the ARQ-utilizing techniques (AX.25, G-TOR, Clover, Pactor).....amateurs were communicating in the heyday of packet radio, using precisely the techniques so vilified</p> </div>
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50 LZHUF binary compression was in usage by at least 1993; as it existed in FBB version 515, which was extant in 1993. Personal Communication, John Wiseman.

51 In an age of tiny hard drives and slow Internet connections, what computer-literate person was NOT aware of compression advances?

52 Personal communication, Colin ZS1RS

53 TAPR: <https://www.tapr.org/pdf/AX25.2.2.pdf>

as illegal by modern-day Petitioners Rappaport et al.: Both ARQ (layer 2) and dynamic (LZHUF) compression (layer 7) were in use in FBB at least by 1993.

These facts would appear to finish off the Petitioner's Argument claim of illegality of dynamic compression / ARQ.

**The FCC said nothing at all against it.  
And has not, for 24 years.**

6) The FCC made its reasoning for accepting advanced lower-level techniques VERY CLEAR in rewriting 97.309a:

"The primary purpose of CLOVER, G-TOR, and PacTOR is to facilitate communications using already- authorized digital codes, emission types, and frequency bands.

The technical characteristics of CLOVER, G-TOR, and PacTOR have been documented publicly for use by amateur operators, 5 and commercial products are readily available that facilitate the transmission and reception of communications incorporating these codes. Including CLOVER, G-TOR, and PacTOR in the rules will not conflict with our objective of preventing the use of codes or ciphers intended to obscure the meaning of the communication. 6 We agree, therefore, that it would be helpful to the amateur service community for the rules to specifically authorize amateur stations to transmit messages and data using these and similar digital codes. Accordingly, we are amending Section 97.309(a) to clarify the rules as requested



	<p>by the ARRL"<sup>54</sup></p> <p><b>Important specific points regarding the techniques found acceptable by the FCC</b>, noting that the FCC approvingly mentioned allowing "similar digital codes":</p> <ul style="list-style-type: none"> <li>• There was no argument from the FCC that any of these specifically named techniques had any difficulty at all with the oft-declared "digital codes" requirements.</li> <li>• In fact, FCC stated these techniques (which included Huffman encoding and thus added bits) were "using already-authorized digital codes" -- thus finishing off the current-day arguments about "digital codes" utilized by modern versions of PACTOR.</li> </ul> <p style="text-align: center;">G-TOR</p> <ul style="list-style-type: none"> <li>• G-TOR includes Huffman compression<sup>55</sup> -- but apparently using a static table.<sup>56</sup></li> <li>• G-TOR includes not only the petitioner's favored Forward Error Correction, but also ARQ (automatic repeat request)<sup>57</sup> And the FCC was quite happy with it.</li> </ul> <p style="text-align: center;">CLOVER</p> <ul style="list-style-type: none"> <li>• Clover also includes the possibility of ARQ.<sup>58</sup></li> <li>• Clover specifically included the LISTEN command<sup>59</sup> (analogous to the same command in all PACTOR modems)--but the monitor would still have to deal with the same issues of ARQ communications that I surmounted in my creation of simple software to monitor WINLINK pactor transmissions.</li> </ul> <p style="text-align: center;">PACTOR-I</p> <ul style="list-style-type: none"> <li>• Pactor (Pactor I) included options to</li> </ul>
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54 FCC: <https://docs.fcc.gov/public/attachments/DA-95-2106A1.pdf>

55 ARRL: Technical description of G-TOR: <http://www.arrl.org/g-tor>

56 Personal communication, Peter Helfert.

57 ARRL: Technical description of G-TOR: <http://www.arrl.org/g-tor>

58 ARRL: Technical description of Clover: <http://www.arrl.org/clover>

59 ARRL: Technical description of Clover: <http://www.arrl.org/clover>

	<p>transmit either straight ASCII or Huffman compressed ASCII (thus requiring additional bits over normal ASCII) "The length of individual characters varies from 2 to 15 bits, with the most frequently used characters being the shortest. " <sup>60</sup></p> <ul style="list-style-type: none"> <li>• Pactor (Pactor I) included ARQ.</li> <li>• One of the prime resources for the ARRL's technical description of PACTOR 1....was Peter Helfert.<sup>61</sup></li> </ul>
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(Intentionally blank to separate the Petitioners' Section I from Section II.)

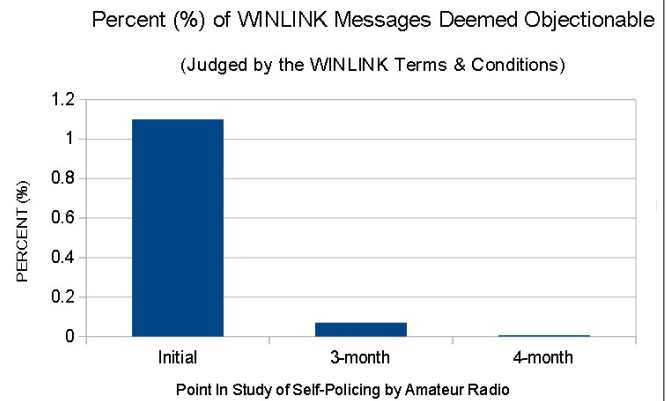
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60 ARRL: Technical description of PACTOR: <http://www.arrl.org/pactor>

61 ARRL: Technical description of PACTOR, <http://www.arrl.org/pactor> citing: Helfert, Hans-Peter, and Ulrich Strate: Pactor Radioteletype with Memory ARQ and Data Compression, *QEX*, American Radio Relay League, Newington, CT, October 1991, pp. 3-6

## II. THE RECORD DEMONSTRATES THAT VIOLATIONS OF SECTION 97.113(a)(4) ENABLE VIOLATIONS OF OTHER RULES GOVERNING THE AMATEUR RADIO SERVICE.

As the above example demonstrates, a narrow interpretation of Section 97.113(a)(4) renders Section 97.113(a)(4)'s prohibition on "messages encoded for the purpose of obscuring their meaning" toothless. A narrow interpretation undermines amateurs' efforts to self-police the amateur bands, consistent with long-standing Commission policy, [See 2013 Order ¶ 6 ("[T]he amateur community has a long tradition of self-regulation.")]. ] and enables the violation of other amateur rules, including:



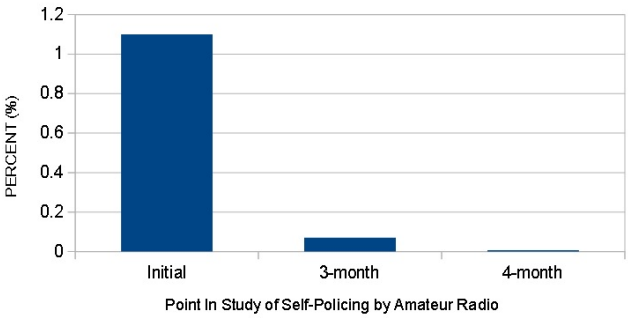
This graph<sup>62</sup> alone destroys this facet of the argument of Rappaport, Fitzgerald, Castle and Marcus -- because self-regulation has not only been incredibly demonstrated --- **but far more so than in any other portion of Amateur Radio.**

There exist NO COMPARABLE OBJECTIVE DATA for

- RTTY
- Microwave
- SSB
- CW
- PSK31
- FT8
- 2 meter FM
- 75 meter phone

*Who knows whether those pursuits have levels of violation down in the same minuscule league with current WINLINK? They may well have --- but it has not yet been shown. The argument of Rappaport, Fitzgerald, Castle and Marcus is without factual basis. They provide NO evidence, no data, no experimental findings. Just words.*

62 Gibby: <https://ecfsapi.fcc.gov/file/10822196770221/ReAnalysisOfWinlinkObjectionableMessages.pdf>

<p>• <b>47 C.F.R. § 97.113(a)(3)</b>, which prohibits “[c]ommunications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer.” For example, Winlink’s current enforcement mechanism reveals that emails traveling through Winlink’s system violate Section 97.113(a)(3). [See, e.g., Reply Comments of Janis Carson, Ron Kolarik, Lee McVey, and Dan White, WT Docket No. 16-239, RM-11708, RM-11759, and RM-11831, at 29-60 (July 19, 2019) (providing extensive evidence in FCC Enforcement Bureau Ticket No. 3184322 that recent e-mails traveling through the Winlink system violate amateur service rules). ] Unfortunately, Winlink’s current enforcement mechanism requires users to log in online and review messages after the messages have traveled over-the-air, therefore rendering traditional, contemporaneous Amateur Radio Service enforcement efforts (e.g., interception over-the-air and decoding for true meaning) ineffective.</p>	<p>Percent (%) of WINLINK Messages Deemed Objectionable (Judged by the WINLINK Terms &amp; Conditions)</p>  <p>Rappaport, Fitzgerald, Castle and Marcus here are <i>several months out of date</i>, and their argument has been totally and completely debunked, by publications of actual original research and original experimental findings.<sup>63 64</sup></p>
<p>• <b>47 C.F.R. § 97.113(a)(5)</b>, which prohibits “[c]ommunications, [made] on a regular basis, which could reasonably be furnished alternatively through other radio services.” For example, Winlink transmits regular e-mail communications, including commercial e-mail communications, [See <i>id.</i> at 29-60 (providing evidence of commercial e-mail communications traveling through the Winlink system). ] over the amateur frequencies. There are many other FCC-regulated radio services available for regularly sending these data communications. [See, e.g., SailMail, <a href="https://sailmail.com/">https://sailmail.com/</a> (Oct. 14, 2019) (“SailMail supports email communications using every internet communications device in all oceans of the world.”); Iridium, Iridium GO!, <a href="https://www.iridium.com/products/iridium-go/">https://www.iridium.com/products/iridium-go/</a> (July 15, 2019) (offering text, talk, . . . [and] access to the web”); and OCENS, Inc., OCENSMail, <a href="https://www.ocens.com/e-mail.aspx">https://www.ocens.com/e-mail.aspx</a> (July 15, 2019) (“Complete e-mail solution for satellite and other low bandwidth connections”). ]</p>	<p>This very tired argument can be applied to almost all of amateur radio (except in disaster situations where cell phones are inoperative) because FCC-regulated CELL PHONES can easily replace all contacts, DX chasing, and social nets. Email or PSK31 or FT8 can easily be replaced by text messaging or Internet forums.</p> <p>In other words, the proponents would have us jettison almost all of amateur radio as illegal, since the development of the cell phone. This is a difficult argument to stomach.</p>
<p>The rules governing the other radio services do</p>	<p>In this passage Rappaport, Fitzgerald, Castle and</p>

63 Gibby: July 30 2019: Initial incidence calculations:

<https://ecfsapi.fcc.gov/file/107301549501394/IncidenceCalculationsExParte0730.pdf>

64 Gibby: August 22 2019: Updated incidence measurements:

<https://ecfsapi.fcc.gov/file/10822196770221/ReAnalysisOfWinlinkObjectionableMessages.pdf>

<p>not require the same level of openness and transparency as the rules governing the use of amateur frequencies. The Commission is clear that the Amateur Radio Service is not like other radio services. In dealing with petitions seeking to broadcast music or bulletins over the amateur bands, the Commission has reinforced the need for the Amateur Radio Service to serve strictly as a hobby, without providing access to or services via the amateur radio spectrum <b>by or for the public</b>. [emphasis added] [<i>Amendment of Part 97 of the Commission's Rules Governing the Amateur Radio Services, et al.</i>, Notice of Proposed Rulemaking and Order, 19 FCC Rcd 7293, ¶ 39 (2004) (FCC 04-79) ("The Commission adopted this prohibition to ensure that amateur service frequencies were not used as a substitute for other communication services.")]. ] Commission has also expressed its "strong commitment to maintaining the unclouded distinction between the amateur service and other radio services." [ 2013 Order ¶ 6. ] Faced with incontrovertible evidence that Winlink is rendering indistinct the barrier between the Amateur Radio Service and other radio services, the Commission should now reaffirm its commitment to this principle.</p>	<p>Marcus seek to allege that the WINLINK system provides services for the public. Presumably they refer to the ability of specific amateur radio operators to be able to accept chosen 3rd party communications from specifically enabled persons. This is a far cry from "the public" but it allows me and others in a disaster situation to reach out to specific governmental, NGO, or emergency-aid-related persons by way of communications relayed through an out-of-disaster gateway and to accept specific replies from these specific persons. While this ability (just like a phone patch) can be abused, I don't understand the deep animosity displayed for this innovative capability.</p> <p>Rather the only incontrovertible evidence observed here is that the authors</p> <ul style="list-style-type: none"> <li>• have done no experimentation &amp; produced no code,</li> <li>• have an out-of-date understanding of the incredible self-policing proven by dramatic advances of a system that is the de facto standard for Amateur Radio formal traffic in emergency logistical communications.</li> </ul>
<p>• <b>47 C.F.R. § 97.115(a)(2)</b>, which restricts third party communications to stations in only certain, specified jurisdictions. The Commission lists countries with which U.S. amateur stations may transmit messages for a third party. [See Federal Communications Commission, Wireless Bureau, Mobility Division, Amateur Radio Service, <i>International Arrangements</i>, <a href="https://www.fcc.gov/wireless/bureaudivisions/mobility-division/amateur-radio-service/international-arrangements">https://www.fcc.gov/wireless/bureaudivisions/mobility-division/amateur-radio-service/international-arrangements</a> (Oct. 14, 2019). ]</p> <p>Winlink's current enforcement mechanism reveals that e-mails have traveled through the Winlink system that violate the third party restrictions. [See Letter from Ari Q. Fitzgerald, Counsel to New York University, Theodore S. Rappaport, N9NB, Director, NYU WIRELESS, and Michael J. Marcus, N3JMM, to Marlene H. Dortch, Secretary, Federal Communications Commission, WT Docket No. 16-239, RM-11831, RM-11828, RM-11759, RM-11708, at 6 (July 24, 2019). ]</p>	<p>Rappaport et al., are completely correct that various <b>control operators</b> have made mistakes.</p> <p>What they oddly fail to point out, is that <b>there are NO regulations requiring the Winlink Development Team to assist the Federal Communications Commission in the investigation and response to such errors</b>. The authors should be appreciative of the free and voluntary assistance provided, at no charge, to the Federal Government.</p>
<p>• <b>47 C.F.R. § 97.115(b)(1)</b>, which requires that,</p>	<p>This question has been discussed at considerable</p>

<p>with regard to third party communications, the “control operator [be] present at the control point and is continuously monitoring and supervising the third party’s participation.” For example, many of Winlink’s control operators are not “continuously monitoring and supervising” to determine whether third party participation complies with the amateur service rules. Instead, these control operators are relying on automatically controlled digital stations (“ACDS”), which send e-mail messages over the amateur bands that may violate the Commission’s rules. satellite-based text, call, e-mail, and web browsing); Globalstar, Sat-Fi2 Satellite Wi-Fi Hotspot, <a href="https://www.globalstar.com/en-us/products/voice-and-data/sat-fi2">https://www.globalstar.com/en-us/products/voice-and-data/sat-fi2</a> (July 15, 2019) (offering “email,</p>	<p>length in previous filings by multiple commenters.<sup>65</sup> The ARRL itself, in its Extra Class License Manual points out that the control operator is considered to be the person who allowed the third party participation and caused the message to be transmitted over the air. Obviously, that person made the choice of</p> <ul style="list-style-type: none"> <li>• time</li> <li>• frequency</li> <li>• station</li> <li>• technique,</li> </ul> <p>all of which are control operator-type choices.</p> <p>Rappaport et al., do not provide that aspect of this confusing question, for which multiple filers have asked for clarification (myself included).</p>
<p>• <b>47 C.F.R. § 97.105(a)</b>, which requires that control operators ensure “the immediate proper operation of the station, regardless of the type of control.” Failure to comply with Section 97.115(b) (1) also leads to violations of this more general provision.</p>	<p>See the deficiencies cited in the previous paragraph.</p>
<p>• <b>47 C.F.R. § 97.101(b)</b>, which prohibits the exclusive use of a frequency. The use of an ACDS to operate part of the Winlink system can cause the commandeering of certain amateur frequencies, effectively shutting out other amateur users and making exclusive use of the frequency.</p>	<p>Perhaps one of the most ludicrous arguments is that a station silently listening to a frequency is <b>COMMANDEERING</b> the frequency! <sup>66</sup></p> <p>The awkwardness of this claim is made even more stark when one realizes that the narrow 97.221(b) segments are always being shared by multiple ACDS users, including</p> <ul style="list-style-type: none"> <li>• BBS stations,</li> <li>• ALE stations,</li> <li>• gateway stations and</li> <li>• perhaps others.</li> </ul>

65 For example, see my detailed discussion beginning on page 7 of:

<https://ecfsapi.fcc.gov/file/10722131064325/REPLYtoCarsonExParteFilingProposal.pdf> Rappaport et al., make no attempt to explain the ARRL position.

66 Carson makes this argument as well: " Winlink permanently occupies a channel for email connections in violation of: 97.101(b): "No frequency will be assigned for the exclusive use of any station." and is incompatible with other peer to peer operations in the HF amateur bands " See Section C, paragraph 1. No explanation of why listening on a frequency equals having been assigned exclusive usage.

[https://ecfsapi.fcc.gov/file/1092523409086/\\$SEPTEMBER\\_24\\_19\\_ARRLreplyFINAL.pdf](https://ecfsapi.fcc.gov/file/1092523409086/$SEPTEMBER_24_19_ARRLreplyFINAL.pdf)

	<p><i>How do the authors choose WHICH of these stations silently <u>listening</u> is "commandeering" that particular frequency?</i></p> <p>Rappaport, Fitzgerald, Castle and Marcus did not explain this.</p> <ul style="list-style-type: none"> <li>• Is it the ALE station?</li> <li>• Is it the WINLINK station?</li> <li>• Or is it the BBS station commandeering this frequency?</li> </ul> <p>NONE of them are transmitting at this moment and none are likely to unless another station CALLS THEM.</p>
<p>A narrow interpretation of Section 97.113(a)(4) that requires specific intent to obscure a message's meaning and thus allows for the effective encryption of messages – so long as the sender can cite <i>another</i> purpose for relying on communications modes that effectively encrypt the message – enables the clear violation of numerous other rules governing the Amateur Radio Service. When it drafted Section 97.113(a)(4), the Commission could not reasonably have intended for its Amateur Radio Service rules and the Amateur Radio Service's primary enforcement mechanism (<i>i.e.</i>, the self-policing by other Amateur Radio Service users) to be rendered toothless. The Commission can correct course by clarifying that Section 97.113(a)(4) prohibits the transmission of encrypted or encoded messages, including messages that are effectively encrypted or encoded and cannot be decoded over-the-air under reasonable propagation conditions for true meaning.</p>	<p>Rappaport, Fitzgerald, Castle and Marcus here commit a logical fallacy by assuming guilt on the part of persons who are innocently carrying out several of the real purposes of the Amateur Radio Service.</p> <p>The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:</p> <ul style="list-style-type: none"> <li>(a) <b>Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.</b></li> <li>(b) <b>Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.</b></li> <li>(c) <b>Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.</b></li> <li>(d) <b>Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.</b></li> </ul>

	<p>It seems apparent that Rappaport et al., at heart, would perhaps prefer a 97.1 more along these lines: :</p> <div data-bbox="914 359 1466 1213" style="border: 1px solid black; padding: 10px;"> <p>a) Perfect ability to read 100% of all transmitted communications (not just callsigns) as a primary requirement, <u>superseding all technical, training, or service goals</u>;</p> <p>b) <b>Limited extension</b> of the amateur's proven ability to contribute to the advancement of the radio art, particularly in the field of making communications more easily monitored, taking longer to transmit, and using more of the precious time-bandwidth</p> <p>c) Encouragement and improvement of amateur service through rules which provide for <u>repetition of existing and past skills</u>, as enjoyed by tens of thousands of amateurs <u>throughout the previous decades</u></p> <p>d) Expansion of the existing reservoir within the amateur radio service of operators <u>trained primarily in the usage of techniques created more than 30 years ago</u>, and with certain techniques created since then of slow speed.</p> </div>
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### III. CONCLUSION

The Commission previously has recognized the Amateur Radio Service's "long tradition of self-regulation." [2013 Order ¶ 6. ] For years, certain parties have undermined this tradition by relying on an ahistorical interpretation of Section 97.113(a)(4) that contravenes the two bedrock principles – openness and transparency – that have enabled amateur radio licensees to effectively self regulate.

### MY CONCLUSION

Thirty years ago, Jean-Paul Roubelat developed innovative spectrum-efficient bulletin board communications beginning in 1987. Winlink, PAT, FLDGI/FLMSG, BPQ and likely other systems have adopted and furthered these advances as part of the fulfillment of 97.1 In the process, *technical expertise and public service have thrived*, and *important radio assets have been created all over the world* **The International Telecommunication Union agrees and is participating as well.**

The WINLINK Development Team has remarkably furthered openness, transparency and self-policing with further innovative developments which Rappaport et al inexplicably ignore. **There has never in the history of amateur radio been such an astounding demonstration of objective self policing.**

The weakness of the positions of their arrayed opponents include

- an apparent lack of grasp of the breadth and wisdom of the 1995 decision that rewrote 97.309(a) and its correct application by the ARRL and others for many years
- a lack of actual creation of any software or advances in the radio art in these areas<sup>67</sup>
- the creation only of *words* designed to obstruct progress
- a failure to create a vast body of technically talented and trained volunteers as suggested by 97.1--even for their goal of monitoring
- an inability to even grasp the subtleties of

<sup>67</sup> This is most glaringly obvious in their complete failure to create software to read WINLINK (or D-RATS, or FLDGI/FLMSG, or PAT or FBB) in a monitoring situation. If the task were of as great importance to national security as was claimed, it should have been accomplished by such luminaries in a matter of hours. An amateur programmer, when I grasped their demand for this, and the success of KX4O at simple cut-and-paste, I was able to create the deconstruction and decompression software in only five days. With only a few hours of additional work, these opponents could have added the necessary front end for ARDOP / WINMOR. But instead, we see only the production of words, designed to stop advances in the radio art rather than meet what are claimed to be pressing needs.

	<p>what the WDT has created and how it functions</p> <ul style="list-style-type: none"> <li>an obsession to the extent that they ignore similar advances such as FLDGI/FLMSG, PAT, D-RATS and others, with their obsessed focus on WINLINK and its supposed "crimes" despite there being no regulations applying to such systems in Part 97.</li> </ul>
<p>Failure to clarify that the rule prohibits the transmission of effectively encrypted or encoded messages that cannot be readily decoded over-the-air for true meaning has restricted amateur licensees' self-enforcement efforts, thus enabling the continued violation of other rules. Accordingly, the Commission should eliminate the lingering uncertainty regarding Section 97.113(a)(4)'s meaning and clarify that the rule prohibits the transmission of effectively encrypted or encoded messages that cannot be readily decoded over-the-air for true meaning.</p>	<p><b>Objective proof that the claims of "effective encryption" are laughable has been copiously provided.</b></p> <p><b>Objective proof of the most objective and <u>most successful self-enforcement</u> in the history of amateur radio, has been provided.</b></p> <p><b>The claims of the Petitioners are completely meaningless as a result.</b></p> <p><b>The Commission should reject this ill-founded set of arcane demands and take further action to prevent any other petition creating fake phrases such as "effectively encrypted" from ever being submitted again.</b></p> <p>The Commission should make it clear to these Petitioners that the actual goals of 97.1 are paramount, rather than the ones these petitioners prefer to put in their stead, and that the principles espoused in their 1995 rewriting of 97.104(a) still apply and are well understood by the ARRL.</p>

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