Before the
Federal Communications Commission
Washington, D.C. 20054

In the Matter of	**)**	
	)	**RM-10805,**
The Amateur Radio Service:	**)**	**RM-10806,**
Proposed Changes to the Morse Code (CW)	**)**	**RM-10807,**
Proficiency Requirement for Operator	**)**	**RM-10808,**
Access to the Amateur Radio Bands	**)**	**RM-10809,**
Below 30 MHz	**)**	**RM-10810, and**
	)	**RM-10811**
	)	

To: The Commission

Reply In Opposition To The Comments of Thomas L. Collinvitti On The Petitions For Rulemaking Retaining Morse Code Testing

I, Leonard H. Anderson, respectfully wish to make some Comments to Mr. Collinvitti's seven Comments. I make these as a private citizen, as a professional electronics design engineer retired but only from regular hours, as a U. S. Army Signal Corps veteran who began in HF radio communication in 1953, and as a long-time radio and electronic hobbyist who has never had any amateur radio license or ever tested for same, nor has any affiliation with amateur radio organizations or businesses or publishers.

Allegation That Morse Code CW Is Spectrally Efficient, Collinvitti Paragraph 1

Collinvitti's first paragraph is: "*Morse code CW is very spectrum efficient by utilizing a minimum amount of bandwidth for communication of only about 25 Hertz per transmitter. Other modes of communication, such as single-sideband voice, are far more wide-banded in an already overcrowded HF spectrum. This is a 12,000 percent difference in spectrum useage! With a finite amount of spectrum available, it would be in the best interest of the FCC and the amateur radio service to use the most narrow modulation form for communication in order to preserve spectrum and to allow more users. Morse code CW optimizes HF spectrum useage. With this in mind, the HF CW requirement and the CW sub-bands need to be retained.*"

"Morse code CW" needs a better definition than can be found in 47 C.F.R. § 97.3 (a) (26).[1] "CW" is properly an acronym for Continuous Wave, a continuous radio frequency signal without modulation or carrying any information. Colloquially, "CW" in amateur radio parlance is **on-off keyed CW** using the International Morse Code character set as defined by the International Telecommunications Union (ITU) and formerly by the International Consultative Committee on Telecommunications (CCITT).[2] Any further reference to "CW" herein is taken to mean **on-off keyed CW**. It is presumed that Collinvitti's term of "Morse code CW" is meant in that way.

The bandwidth of any on-off keyed radio frequency (RF) source depends on the rate and shape of the transitions from "off" (no RF energy) to "on" (maximum RF energy) and vice versa. This holds true whether the rates of change are rapid as in short-range, narrow-pulsewidth radar or in relatively slow-rate CW for communications.[3] There is **no specific Commission regulation on the rate of change of on-to-off state or off-to-on state of a keyed CW signal in Part 97.** There are only generalities such as Parts 97.307 (a) through 97.307 (d) which state that "*No amateur station transmission shall occupy more bandwidth than necessary for the information rate and emission type being transmitted, in accordance with good amateur practice"* from 97.307 (a) or "*The mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency below 30 MHz must not exceed 50 mW and must be at least 40 db below the mean power of the fundamental emission"* from 97.307 (d). From definitions in Part 97.3 (a) (8) "*Bandwidth. The width of a frequency band outside of*

[1] For purposes of this document, Part 97, Title 47 C.F.R., is current as of 1 July 2003 as available from the American Radio Relay League website at http://www.arrl.org.

[2] The CCITT document referenced by nomenclature in Part 97.3 (a) (26) has been revised to an ITU nomenclature for several years. The revised ITU document is available only if a non-member requester pays an additional download fee.

[3] The spectral content of any on-off keyed (switched) RF source may be computed through Fourier Coefficient formulas used with repetitive waveform spectral and amplitude analysis. One such source of forumulas is the *Reference Data For Radio Engineers*, 6th Edition, 1975, published by Howard W. Sams & Co., Inc., a subsidiary of International Telephone and Telegraph Corporation, Chapter 44.

which the mean power of the transmitted signal is attenuated by at least 26 db below the mean power of the transmitted signal within the band." That seems to be in contradiction to the paragraphs of Sub-part D on Technical Standards in that the "bandwidth" can be different..[4]

Rapid transitions from off to on or on to off will generate RF energy well away from the "25 Hz bandwidth" claimed by Collinvitti, whereas slow transitions would confine them within perhaps 30 Hz but with a poor sound in a distant receiver.[5] Depending on interpretation of the Commission's regulations, the "mean bandwidth" could vary considerably. There is no upper bound on the equivalent word rate in telegraphy anywhere in the Commission's regulations so the bandwidth could be greater than 100 Hz; transition times being relatively fast if the word rate was also fast.

Collinvitti negatively criticizes voice modulation as being inefficient in spectral use. While that is true **only** from a spectrum-use viewpoint, Collinvitti fails to mention that spoken English equivalent word rate can be anywhere from 200 to 400 words per minute depending on the speaker. In addition, human voice carries recognition of gender, emotion, and phrasing equivalent to some punctuation plus many other nuances which identify another human being. CW is monotonic, arrhythmic, carries no identification of gender, emotion, or any nuances of identification other than the "fist" or particular ways of dot and dash formation in manual telegraphy. Electronic keying removes the "fist" characteristic in that all Morse Code characters are perfectly formed. Morse Code rates of 20 words per minute can be sustained only by very

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[4] This seems to be an oversight in the Commission's regulations for amateur radio and ought to be addressed by the Commission when and if Part 97 is revised in the future. There is some difference in the total RF energy within a "bandwidth" of 26 db down versus a "bandwidth" of 40 db down insofar as how "mean power" is defined in the regulations.

[5] The "poor sound" referred to is sometimes described as "mushy" or lacking "crispness" in a relatively wide final bandwidth distant receiver. A compromise is to use specific transition shaping circuitry to have a "Gaussian" or "cosine-equared" shape with slow rates of change near off and on states but relatively fast rates of change in between. Such transition shaping circuitry is not employed on the simple low-power transmitters specifically designed for portable CW use; shaping circuitry could easily exceed twice the number of active devices generating and amplifying the RF signal. Some recommended rates of change of keying transitions have published for several years in the American Radio Relay League's annual *Handbook for Radio Amateurs.*

proficient Morse Code operators. Slow voice rates of 200 words per minute are at least ten times as fast as rapid Morse Code and still have all the other identity and nuance clues as to the other operator.

Data or teleprinter modes can effect 100 words per minute text with older electromechanical terminals, require only about 300 Hz bandwidth using frequency-shift keying and 170 Hz shift between Mark and Space frequencies, using "ASCII" to permit both upper and lower case printed letters.[6] Modems with publicly known teleprinter formats such as "PACTOR" can take advantage of forward-error-correction features to achieve a better signal-to-noise ratio in communications than is possible with CW. The "PSK31" manual teleprinting mode is specifically designed to take no more RF circuit bandwidth than CW and achieve 30 words per minute throughput plus allow some on-line error corrections.[7]

Data modes, even the oldest from the 1930s era of teleprinting, do not need specially-trained Morse Code proficient operators at each end of a radio circuit. More humans know and are proficient in standard typewriter keyboards and typing, can visually understand written languages, than there are Morse Code operators, landline or radiotelegraphic types.[8] The same message information is available at each end of a communications circuit at the same time with data modes.

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[6] "Older terminals" refers to those which were in common commercial and military use for teleprinting as of 30 years ago. Those such as Teletype Corporation's Model 28 and Model 33 units are an example. The 7-unit ASCII coding is defined for amateur radio use in Part 97.309 (a) (3). Older still are the Model 15s through Model 19s (60 word per minute throughput) of the Teletype Corporation that served the U.S. military and commercial communications from before World War Two.

[7] PSK31 was innovated by Peter Martinez, G3PLX, in the United Kingdom and was first described over five years ago in *Radio Communications*, the membership magazine of the Radio Society of Great Britain (RSGB). The mode was pioneered among European amateurs and the method later described in *QST*, the membership magazine of the ARRL.

[8] While there is no absolute numerical proof of this, an informal proof is available by observation of the now-common desktop computer, workstation, or laptop computer in homes and offices and various industrial locations worldwide. Add to that the commercial and military use of electromechanical teleprinters that came into being during the 1930s and were widely used for the next half-century. There are no manual telegraphy services in the United States today other than in amateur radio.

Allegations That Amateurs Must Communicate Outside The Country

Collinvitti writes in paragraph 2: "*Since High Frequency (HF) amateur radio signals easily propagate across international boundaries to countries with spoken languages other than English, it is necessary to communicate with people from those countries using a common mode. That common mode is the International Morse code, where standard "Q" signals are used for communication regardless of the spoken language. So it is important to retain Morse code as a requirement as it is easily understood worldwide."*

Collinvitti makes a great leap in logic and association from first sentence to last sentence in the above quoted paragraph. First of all, there is no imperative in the Commission's regulations that require all United States radio amateurs to communicate with those amateurs outside our borders. The Commission gives all United States radio amateurs the **option** to communicate with any other amateurs, with the exception of only a few countries.

Collinvitti is apparently unconvinced that the majority of spectral space allocated to U. S. amateur radio is above 30 MHz, not below it. Further, there is considerable experience that there is beyond-radio-horizon amateur radio communications above 30 MHz despite the relative rarity of such "skip" and auroral or meteorite-trail events.

The choice of International Morse Code as a standard telegraphic "language" (actually a character set, not a language per se) is one of convenience and has its origins in **public telegram exchange** rather than for radio purposes. ITU-T Recommendation F.1, adopted in March, 1998, specifies the character set, character and symbol spacing, but no equivalent word rate nor any "Q codes."[9] Three-letter Q codes are not defined in the Commission's amateur radio regulations; such definitions exist as a quasi-standard in non-official documents. While Q codes save considerable time for radiotelegraph operators, none of the quasi-standard listings are adequate for message transmissions of a more general nature.

While it is certainly agreed that a standard for international telegraphy effects a good

[9] Part 97.3 (a) (26) specifies CCITT Recommendation F.1 dated 1984. The ITU documents for that indicate it has been replaced by ITU-T Recommendation f.1 dated 1998. The 1998 Recommendation is 65 pages and titled *Operational Provisions for the International Public Telegram Service.*

communications environment, that is **not a valid reason for retention of the Morse Code test for any United States amateur radio license.** Those who have the aptitude for Morse Code can use that mode in international amateur radio communications as a result of self-training or from training in past military or civilian occupations. There is **no existing Commission regulation stating that U. S. radio amateurs must communicate outside the boundaries of the United States.**

Morse Code, per se, is no more an "international language" than the American Standard Code for Information Exchange 7-unit teleprinter character set is an international language. Both are representative character sets for the English language alphabet, western numeral system, most punctuation. Millions of humans whose primary language is syllabic or ideographic all face the arduous task of having to learn a very new second written language along with sound associations for that second language when they are forced to use International Morse Code for telegraphic communication.

Collinvitti's second paragraph is as specious as the first, neither of which having any clear validity for retention of the Morse Code test for an amateur radio license, any class.

Allegation That Today's Written Amateur Radio Tests Are Too Easy

Collinvitti's third paragraph is a common complaint among long-time radio amateurs, especially so in the light of written test element question pools having both question and answers. That may lie with the basis for 47 C.F.R. § 97.523, Question Pools: "*All VECs [Volunteer Examiner Coordinators] must cooperate in maintaining one question pool for each written examination element. Each question pool must contain at least 10 times the number of questions required for a single examination. Each question pool must be published and made available to the public prior to its use for making a question set.*" Collinvitti states that the FCC "freely distributes [the questions and answers to the tests]." That is not the case. 97.523 states that the VECs must do that. Note also that the number of questions in a question pool ***"...must contain at least 10 times the number of questions required."*** Today's question pool sets have **only 10 times** those required. More could be generated by the VEC Question Pool Committee (QPC)

without violating any existing regulation or requiring any regulation revision.

Larger question pool sets can defeat the allegations that all license applicants "memorize the set rather than learning the material." When written examinations can be generated by personal computers and the question pool sets distributed electronically, each license applicant's written test can be unique with all questions chosen randomly by the test generation program. Regardless, the allegation of "memorizing rather than learning" is not proven, only used as a masking misdirection away from the Morse Code test.

Those who are truly interested in the written tests can contact the VEC QPC individually as to question and answer content. Such is **not a subject for the 7 petitions now open for comment.**

Allegations That Amateur Radio's Technical Standards Are Degraded

Collinvitti's last sentence of his paragraph 3 states: "*Amateur radio's technical standards have been degraded enough already.*" Apparently that is in regard to Report and Order 99-412 establishing that there was to be only one Morse Code rate of 5 words per minute, down from the three rates of 5, 13, and 20 words per minute of older regulations.

United States Amateur Radio Service is **not** an "Amateur Radiotelegraphy Service." All allocated modes of communication are **optional to use** by any licensed U. S. radio amateur. Morse Code is **not** mandated by the Commission to be used over and above any other allocated mode, any band, any class licensee. To paraphrase the Apollo 13's Flight Director's famous statement, **option is not a failure.**

A Summary And Conclusion

There is no valid reason for retention of the Morse Code test in United States amateur radio for either technical or legal reasons. Retention of the Morse Code test only serves as emotional sustenance of those already licensed in the amateur radio service who will never again be expected to take any test in their lifetimes, provided they renew their licenses in accord with regulations. Retention of the Morse Code test provides a barrier to uncounted numbers of future Americans who are interested in the communications and technical aspects of amateur radio, not in becoming members of a living museum of old radio skills.

The Commission must continue to look towards and prepare for the future for **all** Americans, not to satisfy a minority of amateur old-timers. The future is full of promise for Americans as we are a nation of innovators, of pioneers in technology, especially those of radio and electronics. Change is inevitable. The Morse Code test has proved its worth in the past. We no longer live in that past. Those who have become proficient in Morse Code should feel secure that they have accomplished a personal task and met test requirements of older times. However, such individual personal accomplishments have no basis for demands that all emulate them in testing in the future, nor subscribe to their personal desires or imaginations. I urge the Commission to discontinue the Morse Code test for any amateur radio license for the benefit of all, present and future. It is time for that change.

Respectfully submitted electronically this 3rd day of November, 2003.

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