

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

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

To: The Commission

**Reply Comments to all Commenters Who Wish to Support the
Petitions For Rulemaking Retaining Morse Code Testing in
The Amateur Radio Service**

I, Leonard H. Anderson, respectfully wish to make some general Comments to all those individuals who seem to regard Morse Code testing as an emotional or traditional requirement. 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. I wish to address the long-stated cliches and articles of faith personally seen of and about U. S. amateur radio for over a half century, looking at them from a realistic, a pragmatic, a practical viewpoint.

The following subject headings do not represent those of any particular commenter. They are used singly and sometimes in concert by many who insist the Morse Code skills must remain in amateur radio.

Amateur Radio Provides a Pool of Trained Operators (for the Nation's Needs).

Yes and no. In regard to Morse Code skill it is a definite no. Only maritime radio has any need to maintain manual radiotelegraphy skills and then only for shipping on the Great Lakes and or on water vessels of a specific tonnage displacement and greater.¹ United States territorial waterways require voice radio communications in harbor and inland areas.

The vast majority of radio communications activity in use today in the United States is non-telegraphy: Voice, teleprinter/data, imagery, both commercial and government. Military

¹ Parts 13 (Commercial Radio Operators) and 80 (Stations in Maritime Services) of Title 47 C.F.R.

communications is done on spectral bands of ELF, HF and higher; commercial radio uses HF and higher. The majority of United States amateur radio communications takes place only on allocated high-MF, HF, VHF, and UHF bands.² There are major technological differences between HF-and-below, VHF-to-UHF, and microwave band operation such that radio hardware for each will be markedly different.

The actual operation of any radio communications station today is radio service specific and then relatively simple technically as a result of design engineering incorporating state-of-the-art advances in radio-electronics technology. In Private Land Mobile Radio Service (perhaps the most numerous in terms of radio sets) and Aviation Radio Service, a mobile user simply selects a channel or specific frequency and depresses a push-to-talk switch button to speak; this is simple enough to do while a mobile station is in motion without undue cause of danger to the station's vehicle.³ Electronic technology advances in frequency control allow precise settings by digital selection and display or by preset selections identified by convenience to the operator and service rather than the frequency itself. Where a radio service communicator must use frequencies different by a large ratio such as an octave or greater, automatic antenna tuners can provide a maximum of transmitter power transfer to most any antenna structure without extra knob-twisting by the operator...or a need for extra manual controls on the radio.⁴

Many radio services have developed specific operating modes and combining of equipment for overall simplicity. As an example, the international civil aviation band is 108 to 137 MHz with voice mode above 118 MHz. Radionavigation aids, one-way communications, alternates omnidirectional radio range modulation carrier frequencies with localizer (landing approach azimuthal information) carrier frequencies from 108 to 118 MHz. Design of the omnidirectional radio range bearing signals allows local air traffic control stations to send voice communications ground-to-air for the benefit of the pilot's workload reduction. Pilots are not required to change frequency settings between separated voice and radionavigation bands. In the Los Angeles, CA, police department, patrol cars are equipped with data terminals to access a

² "Communications" as used here refers to communications between two or more operators/stations ("two-way" would be synonymous) as opposed to broadcasting which is essentially one-way communications. Despite the number of amateur band allocations in the microwave region, amateur radio spectral activity above the 70 cm band remains rare.

³ The "undue cause of danger" might be arguable in light of cause for concern on use of cellular telephone handsets while driving a land vehicle. Cellular telephone handsets are technically small two-way radios but they are operated as an extension of the telephone infrastructure. The discussion is about the common vehicular-mounted radio using a microphone on a cord, the whole operated "simplex" (one station transmitting, the other station listening) as opposed to cellular telephony using "full duplex" mode (both ends of the circuit able to transmit and listen simultaneously). While conjecture, those using full duplex mode may be inclined to pay undue attention to the cellular telephone conversation than the safe operation of a vehicle as compared to simplex mode of an installed two-way radio.

⁴ An example is the line of automatic antenna tuners designed and manufactured by SGC, Bellevue, WA, whose principle product line is HF transceivers marketed towards amateurs and private mobile radio users (particularly for water-craft installations). Operation is entirely automatic and transparent to the user, including internal settings memory features to reduce the very short tuning time.

variety of law enforcement databases while in the field, at a particular crime scene. These terminals work seamlessly over the existing mobile radios, requiring no radio-specific knowledge of operation despite the radio system being absolutely required to enable such data access.

Each major radio service having many radio operators will, in time, develop their own patois, jargon, phrases and expressions. Those develop involving the major activity in those areas that is not radio-related. One radio service's "language" cannot be considered as "correct use on radio" anymore than another radio service's use. Migration from one radio service to another requires operators to relearn procedure and terminology despite all radios operating by the same basic physical laws.

Modern radio communications operation may be learned by nearly anyone unskilled in any radio arts. There are literally millions of Americans who have learned basic radio communications in the past and who are still alive today, none of them involved directly with amateur radio.⁵ There is so little need for manual radiotelegraphy skills outside of the amateur radio service, and so many other radio service radios existing now, along with their operators, that the "pool" concept reverts to a shibboleth. While it may be convenient to retain for political phraseology purposes in regulations, it is untrue from any technical standpoint in general radio operation.

Morse Code Skills Are A Vital Necessity For Emergencies Or Disasters

This is another of the shibboleths common to amateur radio. It fails tests of reason and logic based on the experiences of the United States in the last six decades following the end of World War Two. A radio circuit using Morse Code mode requires Morse Code proficient operators at both ends to effect either one-way or two-way communications. That is an absolute must regardless of the alleged simplicity of radio hardware claimed for on-off keyed "CW." Radio communications employing voice, teleprinter, or electronic data modes require only that operators are proficient in spoken or written language used on such circuits.

Let's consider the situations imposed by emergencies and disasters that have befallen the United States in the last six decades. First, the affected areas fall within dimensions of approximately one hundred miles.⁶ That is well within Near Vertical Incidence Skywave (NVIS) propagation range on HF bands and

⁵ Prime example is the Motorola-designed "handie-talkie" of World War Two, succeeded by the more modern AN/PRC-6 hand-held transceiver of the Korean and Vietnam War era. Fixed-tuned, push-to-talk and release-to-listen operation, it was "learned" and used by military personnel from Army infantrymen through flag-rank Navy officers without any extensive schooling or experience in radio. The modern handheld transceiver used in nearly all radio services of today is based on the same basic communications radio architecture.

⁶ Hurricanes, tornados, earthquakes are natural events. The two northeast United States electrical power blackouts, the latest one in August 2003, are not natural events and are not considered as true emergency or disaster situations here. Hurricanes and tornados may range over larger distances but their destructive effects are generally concentrated in small areas of less than 100 miles dimension. Wildfires have a single ignition point, such as from a lightning strike and may take days to spread over a large area. Population within an affected area can be notified and moved by in-person contact or broadcasts before a wildfire can reach them.

can be used by line-of-sight VHF and UHF radios in repeater relays of one to two links.⁷

Secondly, “sudden” events such as earthquakes do not allow for preparation of days ahead of time and are not at all selective as to their victims. Sudden emergencies may be accompanied by secondary effects such as wide electrical power cutoff.⁸ A much greater “vital necessity” is emergency electrical power sources to effect any radio communication, regardless of mode intended or used.

Third, there is no guarantee that an intense or wide-scale emergency or disaster situation will allow for proficient Morse Code operators at each end. The majority of survivors can be expected to speak and write the local language.

Fourth, Morse Code keying communication, as practiced by radio amateurs, is not necessarily suited to needs of emergency or disaster situations. While proficient radio amateurs can reach respectable rates with Morse Code, that invariably uses amateur radio jargon and common amateur abbreviations. Emergency or disaster communications may require unfamiliar names or phrases to be transmitted, such as medical supplies or construction equipment. Such would require clear-text transmission and accuracy with repeats as needed; medications have both trade and generic names, are generally long and unfamiliar, but must not be misspelled. Teleprinter text or electronic data text would be readable by all and medical personnel could use voices radio directly to avoid mistakes.

Fifth, other radio services, government and military included, have rejected Morse Code modes for public safety on land to public safety at sea. On land in the United States, voice communications using spoken English is the overwhelming primary mode. Internationally, at sea, the maritime community chose the Global Marine Distress and Safety System (GMDSS) to enable automatic sending of distress messages (along with location data from Global Position Satellites) via communications satellites. The United States Coast Guard no longer “guards” (listens to) the old 500 KHz international maritime distress frequency. If all other radio services have rejected Morse Code modes for public safety communications, that should cast doubt on the insistence of some that Morse Code skills are “vital” in emergencies or disasters.

Federal Testing Is A Requirement To Keep Morse Code Skills Existent

First, the Commission has the lawful task of regulating all civil radio in the United States. It is not chartered as an academic or educational institution. Radio license tests of any kind exist solely for the purpose of the Commission’s task in regulation of U. S. civil radio.

Morse Code cognition is an individual human psychomotor skill. Not all humans have an aptitude

⁷ NVIS techniques have been doctrine in the U.S. Army’s land use of HF radio for nearly two decades. This involves only a single, high-angle ionospheric reflection whose conditions are relatively stable compared to long-distance, low-angle (to the horizon) “DX skip” desired by many radio amateurs. NVIS range for HF circuits is at a maximum of about 300 Km.

⁸ An example is the Northridge Earthquake of 17 January 1994. One of the Pacific Intertie MHV towers collapsed resulting in a shut-down of all electrical power to the Greater Los Angeles area affecting about 10 million. This occurred shortly after 4:30 AM local time. Local public safety radio services continued to function due to prepared emergency electrical power facilities, as did hospitals and utility companies. While the telephone service switching centers were overloaded for a brief time, leased lines not routed through switching centers continued to function (such as fire department station alarm circuits) operated normally. Electrical power was gradually restored from about noon onwards midnight of the 17th. There is no record of amateur radio emergency communications during the first day of the Northridge Earthquake. Over 50 people were killed in that disaster.

for such activity.⁹ Enforced-motivational techniques such as “applying oneself diligently, working very hard will allow mastery of the skill” cannot apply when individual humans have a poor aptitude for the skill.

On-off keying techniques were the only possible means of communications by early, technically-primitive radio. Morse Code was already in widespread landline telegraphy by 1896, had over a half century of maturity to select telegraphers and was also an on-off keying electrical device. There is no evidence of needing any federal testing to insure Morse Code survival between 1844 and 1896...or 1912.¹⁰

All human psychomotor skills are acquired through self-learning and practice. At least a half dozen computer-aided Morse Code cognition programs are available on the market with more available for free over the Internet. The Military Intelligence School at Fort Huachuca, AZ, uses two commercial Morse Code cognition computer programs to teach Morse Code cognition required by certain M. I. Military Occupation Specialties.¹¹

If on-off keying Morse Code communication is as “enjoyable” as its practitioners claim, it will survive on its own recognizance. There is absolutely no reasonable validity that any federal testing is “required” for Morse Code skill survival.

“CW” Transmitters Are The Simplest Radios To Build (therefore most survivable)

This is another of the shibboleths in amateur radio. While true for the vacuum tube era in amateur radio (approximately pre-1965), such statements conveniently neglect the receiver. Both receiver and transmitter are necessary at each end of a radio circuit to effect two-way communications.

In the amateur radio “vacuum tube era” a typical beginning project for home workshop construction was a two-tube MOPA (Master Oscillator - Power Amplifier) arrangement for low HF bands. They were invariably single-frequency types controlled by a single quartz crystal in the oscillator. While the oscillator stage could be made into a “VFO” (Variable Frequency Oscillator) type, such would need some type of accurate frequency measurement for calibration and avoidance of out-of-band transmission. Radio Frequency (RF) power output ranged from 2 to 20 Watts depending on the power amplifier tube type and the power supply.¹² Little attention was paid to keying transients or rise/fall time of the RF envelope

⁹ From the World War Two years on through about 1960, the U. S. Army included Morse Code cognition aptitude tests for all new recruits as part of a large battery of aptitude testing to enable steering to appropriate military schooling after Basic Training. While the aptitude results may exist somewhere in old military records, informal information obtained while in military service on such aptitude passing indicated it was less than 10% of the total number of recruits, all of whom had been medically tested and judged fit for soldiering.

¹⁰ The first Morse-Vail telegraph system commercial message was sent in 1844. The Morse-Vail patented telegraph system enabled extension of landline distances through a “relay” or relays of a modified sounder (an acoustic electromagnet) with a contact to act as the manual key switch of the next landline circuit. That invention was sufficient to spread landline telegraphy to many parts of the world. The first demonstration of radio as a communications medium in 1896 (Marconi in Italy, Popov in Russia) used Morse Code in on-off keying. The first United States radio regulating agency came into being in 1912 and required Morse Code proficiency for radio operator licensing.

¹¹ Attachment A of this document.

¹² Only a few reached 50 Watts. All mentions are from amateur publication construction articles.

during keying (important to contain the on-off keyed RF energy within a small bandwidth).

If a companion receiver was also part of a construction project, the vacuum tube version had little in the way of narrowband selectivity or frequency accuracy of tuning or sensitivity (comparable to commercial models of that time). Receivers would require a minimum of three tubes and might share the power supply unit; at least six tubes would be required to approach contemporary manufactured receiver operating quality.

In order to meet the claimed narrowband capability of “CW” modes in on-off keying, the receiver companion must have exceptional selectivity.

Amplitude modulation of simple vacuum tube transmitters was rarely done. Amateur radio technology tended towards the older, traditional amplitude modulation techniques in the tube era. That required an audio power amplifier to be connected in series with the RF power amplifier plate supply, audio power output at least half that of the RF power stage. This is a brute-force type of modulation but it was used in nearly all older AM broadcast transmitters. Lower-power-level modulation used by SSB AM radios was not yet fully acceptable by the mid-1960s.

Vacuum tube based radios are not efficient in terms of primary power consumption, fare badly against semiconductor based radios for portable or mobile applications needed in emergency or disaster situations.

“Simple project” semiconductor transmitters exist today, still following the basic vacuum tube architecture MOPA plan, still restricted to lower HF amateur bands, but with lower RF output powers. The small size of all components requires good vision and a steady hand in construction. Their appeal seems more as novelties than as useful communications tools.¹³

That simple “CW” transmitters could be constructed after the onset of an emergency is ludicrous. There would be no guarantee that a construction work area would exist, or that the components would be available, or that plans to build one would survive, or that there would be simple test equipment surviving to check out a constructed radio transmitter.

“CW” Is The Last Resort In Radio Communication For An Emergency Or Disaster

It would be safe to say it is absolutely the very last considering all the other two-way radios now available. Attachment B is an attempt to show the magnitude of other radio service radio quantities that could be pressed into service during extreme emergencies. That number can be as high as one million for civil radio services. It does not count the existing military radios and facilities at United States military bases or in the state National Guards. Military radios are built to far more extremes of environment and survivability than civil radio equipment. A single Executive Order from the President of the United States could activate military units to aid the civilian population in many ways in the event of emergency or disaster. Military communications is robust, designed for flexibility, is tested in actual field conditions and its operators constantly train in use for the unexpected.

Even if radio equipment survives the onset of a disaster, there is no guarantee that specialist operators will survive. Morse Code operators have specialist skills and at least one must be present at each end of a “CW” radio circuit. Voice or text communications can be understood by anyone, used by anyone.

¹³ One of the popular transmitters used two transistors and was packaged in an empty tuna fish can. Featured in a QST magazine article, it was called the “tuna tin two.” Invariably a simple companion receiver appeared later dubbed the “herring aid.”

Morse Code Is A Legacy That Must Be Kept Through Federal Testing

The Commission is not chartered by Congressional Law to be curator of old radio skills nor to maintain some living museum of the airwaves in requiring all amateur radio operators to be federally tested for Morse Code proficiency. Real museums and real curators of private organizations can do that. The task of the Commission is to regulate U. S. civil radio.

Morse Code Is A Universal Language, Therefore Useful For International Communications

Morse Code is an on-off pattern representation for the letters, numbers, and some punctuation marks in the English language. Morse Code had its development in the United States and the Morse-Vail Telegraph System was used in foreign countries. However, the English language has only twenty-six letters in its alphabet and other alphabetic-based written languages may have more.¹⁴ Languages based on ideographic or syllabic forms have no counterpart to alphabet-based “western” languages.

The adoption of the International Morse Code as a standard on-off keying code by the CCITT and its successor International Telecommunications Union (ITU) is one of convenience in having a single code instead of a polyglot mass of codings.¹⁵

Morse Code Skills Must Be Learned And Practiced First Before Judgement Can Be Exercised As To Test Retention Or Elimination

Nonsense rationalization, twisted logic, brainwashed thinking. Morse code has been in existence for 159 years, has been judged by many others, has been found wanting, has been discarded for communications purposes in the commercial and government world. Manual telegraphy and telegraphers in commercial communications services were long ago displaced by teleprinting as teleprinter methods were faster, more accurate, more reliable, had lower running costs, could work around the clock, did not require specialists at each end of a circuit.

Early, primitive radio needed an on-off keying code to work at all since on-off keying was the only way radio could be a communications medium. Morse Codes were adaptable to this despite the many versions of it in its half-century existence before radio, therefore they were first. The maritime world enthusiastically embraced early, primitive radio since they had absolutely nothing like it for instant, over-the-horizon communications before 1896. Nowadays the major communications modes in the maritime world are voice and data with GMDSS used for distress and safety alerting. All of the other radio services that once depended on on-off keying Morse Code modes have decreased its use or dropped it altogether. Many radio services involved in two-way communications never considered it in the first place.

¹⁴ As one example, written Swedish has twenty-nine letters. The variations on the written forms of alphabet-based languages can be shown on each personal computer’ “code page” selection.

¹⁵ Choosing a single standard form is sometimes dictated by other factors. When the International Civil Aviation Organization (ICAO) chose English as the standard airways and traffic control communications language in 1955, it could have been due to the survivors of World War Two having more English speakers in aviation than any other language at the time.

If the logic of the reason was true, then each and every aeronautical engineer would have to be an accomplished pilot before designing high-performance aircraft...or be an astronaut before designing a rocket or space capsule. If that logic were true, then all gynecologists and obstetricians would have to be female and all pediatricians would have to be parents. Similarly all Catholics seeking marital counseling could not have counsel from priests who took vows of celibacy. No one could plan anything new since none would have experience in something non-existent. A dozen Americans could never have walked on the face of the moon.

A singular, personal experience in communications by this commenter is given in Attachment C. This was shared by several thousand other military personnel at the same unit in years before and after this commenters' military service. This commenter had learned Morse Code privately up to about 8 WPM prior to Army service, was indifferent to either its alleged superiority or faults...and was never required to use or know any on-off keying radiotelegraphy mode in many and varied communications in the half century following.

Morse Code Must Be Kept As A Test To Show Dedication And Motivation Of All Amateur License Applicants

That can only be described as exaggerated sophistry by those too involved in a singular avocational activity to be reasonable. Amateur radio is, de facto if not de jure, an avocation, a hobby, a recreational activity involving radio done without pecuniary reasons. It is not a military service, it is not a government service, it does not exist primarily to be a public service to all the people in times of emergency or disaster. It is defined as a "radio service" because that is the Commission's term throughout Title 47 C.F.R. to denote a type and kind of radio activity. A regulatory term, not an all-embracing definition of service as specifically in public service.

Some in the U. S. amateur community feel that all newcomers must be answerable to them in terms of somehow proving their worth to that amateur community through license testing. That is remarkable considering that the "amateur community" is not in charge of actual regulation, has no authority to be judgmental about others' "dedication and motivation."

Licensing in the U. S. amateur radio service is a regulatory tool of the Commission, done for its purposes in its lawful task of regulating all U. S. civil radio. It is not a hazing ritual of a fraternal organization done to satisfy older members of the fraternity. No one should be forced to jump through hoops held up by such fraternal long-timers...simply because they had to jump through similar hoops in their long-ago youth.

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. 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 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 old-timers wishing to keep the past alive. The future is full of promise for Americans

as we are a nation of innovators, of pioneers in technological fields of endeavor, especially those of radio and electronics. The future is also a time-place unknown, an insecure continuum for many who dread change from the familiar, the known. We must all confront our individual futures individually and not practice self-denial by holding to the past. What is past is past, not prologue...yet the past of the United States of America was a foundation for trial of the new, the better, the optimism of the pioneers, of proving the new things to be good things. America has succeeded beyond its wildest dreams and that spirit must continue for all of us. Change is inevitable. It must be met and conquered.

The Morse Code test has proved its worth in the past. We no longer live in that past. We must all acknowledge that it is time for it to depart. I urge the Commission to discontinue the Morse Code test for any amateur radio license for the benefit of all Americans, present and future. It is time for that.

Respectfully submitted electronically this 20th day of October, 2003

Leonard H. Anderson
10048 Lanark Street
Sun Valley, CA 91352-4236

Life Member, Institute of Electrical and Electronic Engineers
Veteran, United States Army, Signal Corps, 1952 to 1960
retired (from regular hours) electronic engineer person

Attachments: A, B, C as a separate ECFS file