Dear FCC,
Please accept this filing as my official opinion of the fact that I am against removing Morse Code testing at least for the higher classes of licenses.

Why we should retain a Morse code requirement for the higher classes of amateur licenses

* Introduction

The ITU WRC-03 conference has amended Article 25, removing the mandatory Morse requirement for unrestricted amateur licenses. The revised wording allows each administration to determine for itself whether Morse proficiency should be a requirement for an amateur license. National amateur radio societies around the world must now recommend to their administrations whether the Morse requirement should be retained. It is important to note that this is not the same as arguing that licensees who have not passed a Morse code test should be denied all access to the HF bands. I am in favour of granting some access to the HF bands to those holding restricted licenses. However I believe that this should be done by amending the privileges of the restricted license, rather than removing the Morse code requirement of the unrestricted license. The principle argument will run along the following lines: CW is a useful and popular mode of operation; the education and examination syllabus should include the basic abilities needed to use useful and popular modes; the ability to send and receive Morse code is necessary to operate CW; and therefore the education and examination syllabus should include the ability to send and receive Morse code.

* CW is a Useful Mode

In this section I shall establish that CW is a useful mode. I do not claim that it is the "best" or "most useful" mode (whatever that might mean), or that it is more useful than other modes like SSB or the various digital modes. Indeed, I believe that all these modes have their rightful place in amateur radio.

* Traffic Volume

I think those who doubt whether CW is useful do so because they fail to look at CW in terms of our objectives as amateurs. Some of the opponents of Morse code testing note that most commercial and some military services no longer use CW, and provide that as "evidence" that the mode is no longer useful, or at least not "best of class". However commercial and military requirements and constraints are very different from those facing amateurs. For these services, traffic volume is often the most important consideration; there are rarely any power or equipment limitations; bandwidth limitations are less severe than in the amateur bands; good signals can often be assured by the use of very high power transmitters or satellite communications; and skilled operators are considered an unnecessary expense. However the requirements and constraints facing amateurs are very different, which means that the optimum mode of communication is also different, and in many cases it is CW. For example, consider the fallacy of comparing modes by traffic volume. When I listen to amateur stations operating in all modes, the thing that strikes me most is how little information is being

communicated by most of them. Not because they are hamstrung by inefficient modes, but because they don't actually have very much to say to each other. There are exceptions of course, but the majority of QSOs consist simply of an exchange of signal reports, name and QTH, station and weather information. Even though I always welcome a rag-chew, and often attempt to encourage the other station to go a bit further than the "standard" items, in many cases my attempts are politely rebuffed. In any case, rag-chews certainly don't stretch the traffic handling capabilities of CW.
I am not denying that there are times when amateur stations efficiently handle large volumes of traffic. The very efficient traffic nets in the USA are a good example of this (and by the way many of the best use CW). However for many, perhaps most, amateur activities, traffic volume is not a significant consideration, so one cannot argue that CW is an unimportant mode for the amateur service simply because commercial services, for which traffic volume is the key requirement, no longer make widespread use of it. By the way, the military does still make use of Morse code for specialized requirements. For example, Naval Gunfire Forward Observers of the British Army are "trained in advanced communications, Morse code, adjusting both naval gunfire and artillery, forward air control techniques, and helicopter operations, including helicopter rappels". Morse code is also a requirement for Special Forces units including the SAS and SBS.

* QSO Rate
So what is important? Well for the DXer, DX-pedition operator and contester, the primary consideration is rate - that is, the number of QSOs per hour. For the DXer rate matters because the greater the rate, the greater their chance of making a QSO and getting into the DX station's log. For the DX-pedition operator rate matters because the success of an expedition is often judged by the number of QSOs. And for the contester rate is (almost) everything. When it comes to QSO rate, CW and phone are about equally matched. For example in last year's IARU HF World Championships, where the phone and CW contests take place during the same 24 hour period and under the same propagation conditions, the top single-operator phone station was KH6ND with 2,451 QSOs, while the top single-operator CW station was P3F with 2,816 QSOs. Digital modes trail slightly - although the IARU HF contest does not include digital modes, a comparative figure is the 1,912 QSOs made by KI1G, the top entrant in the ARRL RTTY roundup. Although this contest runs for 30 hours, contesters may only operate for a maximum of 24, so the comparison is a reasonable one. To avoid upsetting anyone, let's just agree that CW, phone and digital modes all achieve similar QSO rates. That is sufficient for this argument.

* Bandwidth Efficiency
One of the areas where CW is clearly superior to most other modes is bandwidth efficiency. CW can achieve a similar QSO rate to phone while accepting a channel spacing of 250 Hz or less, compared with the 2,500 Hz minimum required by phone. This means that the QSO rate per Hertz of bandwidth occupied is at least ten times greater for CW than it is for phone. The only other mode that can compete with this remarkable efficiency is PSK-31. Bandwidth efficiency is especially important in the amateur service given our limited amateur allocations. (Anyone who claims that our HF allocations are underutilized has never operated during a major contest!)

* Readability under Poor Signal Conditions

When it comes to weak-signal performance, CW is a clear leader on the HF bands. Listening tests have shown that SSB operator-to-operator grade service with 90% intelligibility of related words by trained operators requires a signal to noise ratio of 48 dB-Hz for a bandwidth of 3 KHz. A similar level of intelligibility can be obtained with a CW signal to noise ratio of 27 dB-Hz in a 500 Hz bandwidth, while RTTY requires a signal to noise ratio of 55 dB-Hz. This means that for the same level of intelligibility, a phone signal requires 11 dB more power than a CW signal; and an RTTY signal requires 28 dB more power. For CW signals in a 250 Hz bandwidth the advantage over SSB is about 13 dB. In other words, to achieve the same intelligibility under poor conditions as a 100 W CW signal you would require a 2 KW SSB signal! I notice this effect regularly when band conditions are poor and I hear SSB operators whom I know to run high power into large beams complain that conditions are "impossible", while I still manage CW QSOs with 100 W and a dipole. Admittedly some of the newer digital modes like WSJT also provide excellent weak-signal performance. However these modes are designed specifically for VHF operation. The best HF digital modes, like PSK-31, still fall short of CW in weak signal ability. The relative power efficiency of CW is of particular benefit to operators who use simple low-powered stations, which is likely to be the case for operators from previously disadvantaged communities. It will become ever more important as we move deeper into the trough of the solar cycle over the next few years.

* Simplicity and Home Construction

One of the objectives of amateur radio is to encourage home construction. Here CW has a distinct advantage, since CW transceivers are inherently less complex, and hence less expensive and easier to construct than, phone transceivers. For example, the Small Wonder Labs "Rock Mite" QRP CW transceiver kit retails for US $30. I do not know of any comparably priced SSB equivalent.

* Low Power Requirements

CW transceivers also often have significantly lower power drain than multi-mode designs. For example, an Elecraft K1 draws only 55 mA on receive. This makes CW transceivers ideal for battery-powered "adventure radio" operations, for example for operations from mountain summits. Commonly used portable SSB transceivers like the Yaesu FT-817 draw as much as 450 mA, making them much less suited to sustained battery-powered operation.

* The CW "Lingua Franca"

The abbreviations and pro-signs used in CW communications make it possible for operators who do not speak the same language to communicate at least basic information. This means that proficiency in English is not a requirement for successfully communicating worldwide using CW, which is an obvious benefit in our attempts to facilitate amateur radio amongst previously disadvantaged communities.

* Emergency Communications

One of the roles of the amateur service is to provide emergency communications in the event of a national disaster. Many different modes might be utilized, depending on the circumstances. If the emergency is localized, then FM repeater communications are likely to play the leading role. For more widespread emergencies, HF communications are important. If the emergency leaves our computer systems operational, and if propagation is fairly good, then digital

modes might be most effective. If computers are unavailable but we can rely on high power transmitters and fair propagation, then SSB might be the mode of choice. If we lose our computers and have to operate with limited power (for example from backup batteries or solar power) or under poor propagation conditions, then CW might be the best (and only) way to get through.

* Summary

If you want to operate on DXpeditions or in contests, CW satisfies the key requirement for a high QSO rate. CW also makes better use of limited amateur spectrum than most other modes. If you have a limited budget or power or antenna restrictions, then CW provides you with better intelligibility under poor signal conditions than any other common HF mode. If you want to construct your own equipment, then CW allows simpler and less expensive transceiver projects. If you want to operate from remote places using battery or other alternative power, then CW is the most power-efficient mode. And under certain emergency conditions, CW may be the only mode possible. For these reasons I believe that no-one can honestly claim that CW is no longer a useful, or even an important, mode of communications.

* CW is a Popular Mode

It may surprise you to discover just how popular a mode CW is. A recent multiple-choice survey on the ARRL web site, which was open to all amateurs (not just ARRL members), asked the question "what percentage of your operating time is spent using CW?". The results were as follows:

Answer	Percentage of Respondents	Number of Respondents
I do not operate CW	32.6%	1002
Less than 25%	17.1%	525
26-50 %	6.2%	192
51 - 75%	8.6%	265
76 - 100%	35.4%	1089

So if this survey is accurate then it would appear that 44% of amateurs spend more time on CW than on all other modes put together. CW is also a popular contesting mode. A quick check showed that 3645 CW logs were submitted for the CQ Worldwide 2002 contest, compared to 4050 SSB logs. Admittedly, worldwide the contest statistics are tilted somewhat more towards SSB. The 2002 HF CW contest received 15 entries as compared to the phone contest's 40 entries. However the CW contest still received more entries that the VHF Contest (14 entries), 40m Simulated Emergency contest (10 entries) or the 80m QSO Party (3 entries)5[6]. Again, I am not arguing that CW is the most popular mode. Only that it is one of several popular modes. Or, to misquote Oscar Wilde, "reports of its death are greatly exaggerated".

* The Education and Examination Syllabus

Having established that CW is both a useful and a popular mode of amateur communication, it is easy to show that our education and examination syllabus should include at least the basic abilities required to operate in this mode. After all, one of the main purposes of the syllabus and examination is to equip new amateurs to operate efficiently, legally and safely using the most common and useful modes. I am not suggesting that CW should receive any special treatment here compared with other useful and popular modes like FM, SSB and some of the digital modes. I think it is important for the education syllabus to include the basic abilities needed to operate in all these modes.

Why not just allow candidates to select the modes they intend to operate in, and only learn the skills necessary for those particular modes? Well I can think of a couple of good reasons not to do that:

1 - A new amateur generally does not know enough about the different modes to make informed decisions until he or she has had a chance to use them in practice. So if we do not provide candidates with at least the basic abilities needed to try out each of the modes, then we are not equipping them to make an informed decision about which modes to use.

2 - It would be a nightmare to administer. Would we create a separate license class for someone who wanted to operate CW, RTTY and PSK-31, but not AM, SSB or FM? They of course should not be required to learn the phonetic alphabet, as it is not relevant to any of their preferred modes - but how would we administer or enforce such an unwieldy set of options?
So I think there are sound reasons to give a basic grounding in all the popular and useful modes to all candidates, and allow them to make their own choices once they have had the opportunity to try out the different modes. Now I admit that this does not happen very well today. Although SSB and FM operating procedures are included in the examination syllabus, we have lagged behind the development of digital modes. We do not, for example, examine either the theory or the practice of PSK-31, which is becoming increasingly popular and which is certainly also a useful mode. But the fact that our syllabus has lagged behind the development of digital modes should be seen as a reason to include more about digital modes in the syllabus, so we can properly equip new amateurs to make the most of them. It does not make sense that because we have lagged in this area we should stop preparing our candidates properly for other modes like SSB, FM and CW.

* The Morse Requirement
So what does it take to have basic operating ability in CW? Well clearly the ability to send and receive Morse code. Someone with no Morse code ability cannot be considered basically competent in CW, just as someone who did not know the phonetic alphabet could not be considered basically competent in any of the phone modes. Of course some may argue that since computers can send and receive Morse code, competence in using computers and soundcard interfaces (which will in any case be needed for the digital modes) could also suffice for CW. However if you look back at the attributes that make CW such a useful mode, you will see immediately that this is not the case as many of these advantages fall away if computers are used to generate and receive Morse. Computers cannot read Morse correctly under poor conditions; it is not simple