

Before the  
Federal Communications Commission  
Washington, D.C. 20544

In the Matter of ) WT Docket No. 98-143  
)  
1998 Biennial Regulatory Review -- ) RM-9148  
Amendment of Part 97 of the Commission's ) RM-9150  
Amateur Service Rules. ) RM-9196  
)

To: The Secretary  
Federal Communications Commission

c.c.: Chairman William E. Kennard  
Commissioner Susan Ness  
Commissioner Michael Powell  
Commissioner Harold Furchgott-Roth  
Commissioner Gloria Tristani

Reply Comments of Edward E. Mitchell, Ham Radio Online

## Summary

The ARRL's filing in WT Docket 98-143 provides the published results of an opinion survey conducted in late 1996. The survey results were quoted by the Commission in WT Docket 98-143 and are used by the League as the primary justification of retaining telegraphy proficiency in the Amateur Radio Service. However, the statistical analysis presented in their article is misleading. The data *does not* support the claim that most Amateurs support retention of a telegraphy requirement.

The survey claims that 54% of all non-ARRL members (80% of all Amateurs) favor retention of a telegraphy requirement. The ARRL did not report that the 95% confidence interval for this result was + or - 6%, meaning that the *actual population percentage* could be anywhere from 48% to 60%<sup>1</sup>. Since this confidence interval spans

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<sup>1</sup> In fact, the results are not even conclusive at the statistically very weak 80% confidence level.

the 50<sup>th</sup> percentile we cannot statistically conclude that a majority favor retaining the telegraphy requirement.

Regardless of the survey, fundamentally the Amateur Radio Service does not exist to serve itself but exists only to serve the general public. The general public is not demanding telegraphy services – the current demand for telegraphers is essentially nil. Therefore, the continued reliance on telegraphy requirements in the Amateur Service is out of synch with the services demanded by the public we serve. It is time to bring the regulatory structure of the U.S. Amateur Radio Service in line with the goals and requirements of the 21<sup>st</sup> century.

## **Introduction and Background**

1. In my original comments I strongly supported the effort to reduce the number of license classes from six to four or three licenses. I also provided extensive comments and analysis regarding what I termed “*the rationale argument for – or against – a telegraphy requirement.*” Specifically, Amateur Radio exists to serve the public. Does the public have a greater need for telegraphers or technicians and engineers skilled in the radio and communication arts? There is substantial evidence that the public has little or nil demand for telegraphers but has an enormous demand for technicians and engineers. The Amateur Radio Service must be oriented to serve the public, meaning the fostering of modern communications specialists, not telegraphers. As described at length in my original filing, there is today little justification for the continued requirement of demonstrating telegraphy proficiency for Amateur Radio licenses. Article S25.5 of the International regulations currently requires demonstration of telegraphy proficiency; however, in a few years it is likely that this requirement will be stricken from the International regulations.

2. In my reply comments I address the comments filed by the ARRL in regards to their justification for the selection of 5 wpm and 12 wpm telegraphy requirements. I provide detailed analysis of the opinion survey they used as the justification for continued telegraphy proficiency in the Amateur service. Based on the analysis, the ARRL survey does not support the position of mandatory telegraphy proficiency.

3. I have been a licensed Amateur Radio operator for 26 years since first licensed at the age of 13. I have been involved in most all aspects of Amateur Radio including but not limited to satellite communications, HF operation (including CW), ATV, FM repeaters (including assisting in the construction of such systems), digital packet radio operation and especially in emergency communications and public service. I am a member of the ARRL, AMSAT, The SETI League, and the IEEE. Since 1995, I am the publisher of Ham Radio Online; the world's leading independent online web site devoted to Amateur Radio and telecommunications topics. Ham Radio Online is found on the Internet at <http://hamradio-online.com> and is currently read in 93 countries<sup>2</sup>. Professionally, I have worked in the high technology sector for the past 18 years, spending the last five years at an internationally respected personal computer company where I was extensively involved in advising the company in regards to wireless communications opportunities. These opportunities included wireless data communications in short range, unlicensed PC peripheral radio devices, metropolitan area wireless technology solutions, through broadband, high speed wireless Internet access using MMDS, LMDS and 38 GHz millimeter wave technologies.

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<sup>2</sup> For the purposes of determining a country count for Ham Radio Online, the ARRL's DXCC Awards criteria, roughly, are used. The DXCC Awards list assigns the status of "country" to geographically distinct, but not necessarily "politically distinct" territories. For this reason, the country count, by political territories, is slightly less than 93.

## Specific Issues

4. The ARRL provides an appendix to their filing showing the published results of a September 1996 opinion survey commissioned by the League. The results of this survey, published by the ARRL in February 1997, were quoted by the Commission in WT Docket 98-143 and are used by the League to bolster their argument for retention of a telegraphy requirement in the Amateur Radio Service. However, a close inspection of the statistical analysis presented in their published article reveals questionable interpretation of the data. *Contrary to the ARRL's claim, the study does not support the conclusion that U.S. Amateurs, as a whole, support retention of a telegraphy requirement.*

6. Per the February 1997 article<sup>3</sup>, the ARRL surveyed two groups of Amateurs. One group was a stratified sample of the ARRL membership, while the second was a smaller, systematically selected sample of non-ARRL members. The basic conclusion of the survey was that 57% (+/- 2.9%)<sup>4</sup> of *all* Amateurs favor retention of a telegraphy. But this result is flawed for several reasons:

(1) The ARRL membership is not a representative sample of the Amateur population, but in statistical terms is a *self-selected group* surprisingly biased towards holders of Extra and Advanced class licenses. As will be shown, the extent of this discrepancy is significant and a survey of ARRL members can not be statistically extrapolated to the U.S. Amateur population as a whole.

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<sup>3</sup> "Results of the 1997 WRC-99 Opinion Survey", by David Sumner, K1ZZ, appearing in February 1998 QST and attached to the ARRL filing in WT Docket 98-143

<sup>4</sup> When I combine the samples using the weighted calculation for stratified samples and the 1997 Amateur population total, I arrive at 55.9% (+/- 2.9%), possibly due to the use of the 1997 Amateur population. Further, the ARRL article states that the non-ARRL member group was selected using a *systematic* method. Statistically, this is not considered as reliable as using a truly *random sample* (see page 259, Practical Business Statistics, Andrew Siegel, Irwin, 1997). There is no valid way to compute an unbiased estimate of

(2) The figure of 54% of non-ARRL members favoring retention of a telegraphy requirement is misleading because this is a *sample percentage only*. When this estimator is applied to the total population, the 95% confidence interval extends from approximately 48% to 60%, based on the ARRL's published sample size of n=262. The *actual population percentage* may lie anywhere within the range [48% - 60%] so we cannot statistically say that a majority of non-ARRL members supports retention of the telegraphy requirement. At the 95%, the 90% and even the statistically weak 80% confidence levels, the result is inconclusive. The derivation of this confidence interval will be shown.

5. In this section, I show that the ARRL membership is not a representative random sample of the general U.S. Amateur population and can not be used to statistically estimate of the views of the overall U.S. Amateur population.

ARRL members represent approximately 20%<sup>5</sup> of the U.S. Amateur population and would intuitively seem to be a representative sample of the Amateur population. However, this is not the case. The ARRL membership is heavily skewed (statistically biased) towards holders of Extra and Advanced class licenses and significantly under represents Technician, Technician Plus and Novice class licenses. Table 100 shows both ARRL membership and U.S. Amateur licensees, as a percent of all license holders.

**TABLE 100**

Table 100 shows the distribution of Amateur license holders by license class, in the U.S. Amateur population as a whole, and as a percent of ARRL members. As shown, 51% of all Extra class licensees are ARRL members, while just 13% of Tech licensees are ARRL members. As such, the ARRL membership is heavily biased or skewed to Extra and Advanced class licensees and is not a representative sample of the U.S. Amateur

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the standard error. For the purposes of my analysis, I assume that the systematic sample produced a representative random sample.

<sup>5</sup> We know that not all ARRL members are U.S. Amateurs and that some may not hold an Amateur license at all. For the purposes of my analysis, I have assumed that all members are U.S. Amateurs per Figure 1 of the ARRL report.

population. *Note: The ARRL membership distribution is from Figure 1 in the ARRL report. The U.S. Amateur population numbers are for a period approximately 1 year later and are quoted from the W5YI Report in a letter to a Ham Radio Online, by Bill Sohl, K2UNK.*

<b>Table 100</b>	ARRL	12/1/1997	Represented in	As a % of all
License Class	Members	US Amateurs	ARRL Membership	US Amateurs
Extra	38,852	75,694	51.33%	10.52%
Advanced	39,430	112,482	35.05%	15.63%
General	25,245	124,415	20.29%	17.29%
Tech Plus	22,534	147,559	15.27%	20.50%
Tech	24,021	179,559	13.38%	24.95%
Novice	2,627	79,965	3.29%	11.11%
Total	152,709	719,674		

67% of ARRL members hold Extra, Advanced or General class licenses yet Extra, Advanced or General class license holders represent just 43% of the overall U.S.

Amateur population. 33% of ARRL members hold Technician, Technician Plus or Novice licenses, while in the overall U.S. Amateur population, this group represents 57% of all Amateurs. For Technician licensees specifically, this group represents nearly 25% of all U.S. Amateurs, yet only 13% of the ARRL membership holds a Technician license.

Chart 100 provides graphic evidence of the skewed membership of the ARRL.

### **CHART 100**

This chart shows U.S. Amateurs, by license class. Series 1 shows ARRL members. Series 2 shows the total U.S. Amateur population. In this form, it is easy to see that the ARRL membership seriously under represents the views of those who hold Technician Plus, Technician and Novice licenses.



As such, the ARRL membership is *not* a representative sample of the U.S. Amateur population and is extraordinarily *biased or skewed* to Extra, Advanced and General class licensees. The only valid conclusion is that *63% (+ or - 3.1%<sup>6</sup>) of ARRL members* favor retention of the telegraphy requirement but this estimate cannot be used to statistically estimate the views of all U.S. Amateurs. Additional evidence that the ARRL does not represent the views of the U.S. Amateur population comes from ARRL Field Services Manager, Rick Palm, K1CE who says that ARRL membership has dropped by 14,000 members (an 8% reduction), since March of 1997<sup>7</sup>. This massive drop, which did not occur in the overall Amateur population, suggests the ARRL is losing members because it has failed to capture the views of the overall Amateur population.

*6. Because non-ARRL members represent nearly 80% of the U.S. Amateur population, the survey of non-ARRL members is a close approximation of the overall Amateur population. According to the survey, 54% of non-ARRL members favor*

retention of a telegraphy requirement. Simple statistical calculations show that the confidence interval is +/- 6% at the 95% confidence level<sup>8</sup>. Because the 50<sup>th</sup> percentile lies inside the interval, we cannot conclude that a majority of non-ARRL members (meaning most Amateurs) favor retention of a telegraphy requirement.

From the ARRL article, 500 surveys were sent to non-ARRL members. 77 of these were returned as undeliverable. Thus 423 were delivered. Of those that were delivered, the ARRL article states that 62% were returned. Therefore, the sample size of the non-ARRL member survey is 62% of 423 or n=262. No confidence interval is presented in the published ARRL report; however a confidence interval can be easily calculated<sup>9</sup>. Since this is a binomial distribution, we can calculate the standard error using

$$\pm t \sqrt{\frac{p(1-p)}{n}}$$

where p=.54 (from the survey results), n=262 and t=1.960 from Student's t-Table for the 95% two sided confidence level. Using the stated values, this calculates a confidence interval of + or - 6 percentage points - a range of 48% to 60%. Because the confidence interval spans the 50<sup>th</sup> percentile, the result is inconclusive. *The actual population percentage* could be anywhere within this confidence interval.

7. Table 101 shows the results of the ARRL survey question regarding favoring (Yes) or disfavoring (No) retention of a telegraphy requirement. This table shows the percentage favoring or not favoring the telegraphy requirement, organized by license class and by ARRL member or non-member status. As shown, ARRL members who hold

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<sup>6</sup> The confidence interval is not provided by the ARRL but calculated, as described in paragraph 6 using n=914 (merged sample size of 1176 minus 262 non-ARRL members), p=.63 and t=1.960.

<sup>7</sup> This data and source appeared in Amateur Radio Newslines number 1117, issued on January 8, 1999.

<sup>8</sup> Statistical tests are normally conducted at the 95% or higher confidence interval (such as 99% or 99.9%). Even at the weak 90% level or the very weak 80% level, the result of the ARRL survey does not provide a conclusive result because the confidence interval still spans the 50<sup>th</sup> percentile.

Extra, Advanced or General class licenses strongly favor retention of a telegraphy requirement – and as shown by Table 100 and section (5) of this filing, this group is strongly over represented in the survey results. Conversely, ARRL members who hold Tech Plus, Tech or Novice licenses do not favor (or have no opinion or did not answer) retention of the telegraphy requirement.

**TABLE 101**

Table 101 is the result (in percentages) of the opinion survey conducted by the ARRL, as presented as Table 1 in their February 1997 article. The table, together with Table 100, shows how the highly skewed ARRL membership over represents the opinions of Extra, Advanced and General class licensees and under represents the opinions of Tech, Tech Plus and Novice licensees. The data shows large differences in the opinions of the E,A, and G group versus the T, T+ and N group. The skewed sample of ARRL membership cannot be extrapolated to represent the views of the U.S. Amateur population as a whole.

	ARRL MEMBERS							NON-ARRL MEMBERS							
	Both	E	A	G	T+	T	N	All	E	A	G	T+	T	N	All
Yes	57	75	70	71	46	47	33	63	82	61	67	57	26	67	54
No	35	21	24	23	37	48	16	30	6	26	24	41	68	19	37
NA	8	4	6	6	17	5	51	8	12	13	9	3	6	14	9

However, the data used to construct this table are not adequate to draw meaningful conclusions because the sample sizes are too small. For example, amongst non-ARRL members, Table 101 shows that 61% of Advanced class licensees favor a CW requirement. While the group size is not given, we can easily estimate the approximate size. From Table 100, 15.6% of U.S. Amateurs hold Advanced class licenses and 35% of those are ARRL members, therefore only 65% of the Advanced class licensees are in the sample population of non-ARRL members. Of the 262 non-ARRL members surveyed, the expected distribution of the non-ARRL member sample is calculated and shown in

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<sup>9</sup> See Chapters 9 and 10 and especially pages 284 and 285 of Practical Business Statistics, 3<sup>rd</sup> Edition, by

Table 102. From Table 101,  $p=.61$ ,  $t=1.960$  and from Table 102,  $n=33$  so that the 95% confidence interval is a whopping  $\pm 16.6\%$ ! This means that the *actual population percentage* could lie anywhere within a range of 44.4% to 77.6%<sup>10</sup>!

The percentages shown in Table 1 of the ARRL report are not statistically useful due to their wide confidence intervals. Their inclusion in the ARRL report, without noting the wide confidence intervals, is misleading and the Commission should not consider this table in any part of this proceeding.

**TABLE 102**

Table 102 is the expected distribution, in number of Amateurs, by license class of the non-ARRL sample. Because 51% of all Extra class licenses are represented in the ARRL membership, and the non-ARRL sample was made from the group that remained, the total number of Extra class licensees in the sample of 262 non-ARRL members is expected to be only 17. These values are then used in calculating confidence intervals for the percentages given in Table 101.

License Class	non-ARRL Population	Distribution of non-ARRL sample
Extra	36,842.00	17.0
Advanced	73,052.00	33.8
General	99,170.00	45.8
Tech Plus	125,025.00	57.8
Tech	155,538.00	71.9
Novice	77,338.00	35.7
Total	566,965.00	262

8. In paragraph 42 of the ARRL comments, the ARRL writes:

“42. The Commission makes extensive reference in paragraph 23 of the Notice to the League's survey, which shows that a majority of League members (63%) favored retaining the telegraphy requirement for amateur licensing in the international regulations, while 30% felt that the Morse requirement for amateur radio licensing is no longer relevant, or soon will not be relevant, as an

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Andrew Siegel, Irwin, 1997

<sup>10</sup> A similar calculation for the Extra class license shows that the sample percentage of 82% has a confidence level of  $\pm 21\%$ .

international regulatory requirement. Among all amateurs surveyed, including non-members, retention of the Morse code requirements was favored by 57%. That portion of the survey is not directly relevant to the instant inquiry of the Commission, since the international radio regulations remain an obligation of the Commission that cannot be waived. However, the survey results indicate that there is a strong perception among amateurs generally that some telegraphy examination requirement remains relevant.”

As I have shown, the opinion survey conducted by the ARRL to justify the argument used in their paragraph (42) is misleading. The survey of ARRL members cannot be used to statistically estimate the opinions of the general Amateur population.

9. In paragraph (43), the ARRL writes:

“The continued popularity of telegraphy is exhibited at all times in any cursory tuning through the HF amateur allocations. There is a substantial amount of regular use of telegraphy on-air, and no indication that there is a "deemphasis" [sic] on amateur use on-air of telegraphy.”

This claim, however, is wholly contradicted by the ARRL’s own survey which reports that:

- *72% of all Amateurs rarely or never use telegraphy* (see the ARRL report “Results of the WRC-99 Opinion Survey”, Figure 4).

## **Conclusion**

10. The primary proponent for a telegraphy requirement for the U.S. Amateur Radio Service is the ARRL. Their quantitative support for telegraphy comes from a misleading interpretation of their September 1996 opinion survey.

- The ARRL's claim that non-ARRL members favor retention of a telegraphy requirement is not statistically justified by their survey. 54% (+/- 6%) of 80% of the general U.S. Amateur population favors retention of a telegraphy requirement but this result is *inconclusive* at even the statistically weak 80% confidence level because the confidence interval spans the 50<sup>th</sup> percentile. We cannot conclude that a majority of non-ARRL members favors retention of the telegraphy requirement.
- 63% (+/- 3.1%) of ARRL members favor retention of a telegraphy requirement; but ARRL membership is proven to be a *non-representative sample* of the U.S. Amateur population.
- According to the ARRL survey, 72%<sup>11</sup> of Amateurs rarely or never use telegraphy.
- If the rules for Amateur Radio were being written today, 60% of Amateurs say *that it should not have a telegraphy requirement* or they have no opinion on the issue (See Table 2, Question #6 in the ARRL survey).

Taken together, these conclusions demonstrate conclusively that support for retaining a telegraphy requirement in the Amateur service is weak. The ARRL's claim for strong support for such a requirement is bogus and is not supported by their own opinion survey.

11. In my previous filing, I argue that there is a rational way to view arguments for or against telegraphy requirements. Specifically, the Amateur Radio Service exists to serve a public need. Therefore, the Amateur Radio Service requirements and structure must be optimized to meet the requirements of the public we serve. This perspective

leads to the rational argument for – or against – a Morse code proficiency requirement. Literally, since the Amateur service exists to serve the public, we must ask, “Does our society demand more telegraphers or more technicians and engineers?” If our society demands more telegraphers, than a telegraphy requirement is important. If our society has little demand for telegraphers, than a telegraphy requirement may hinder our effectiveness at producing more persons knowledgeable in the technical art of radio communications. The evidence strongly suggests that society has a large demand for engineers and a nil demand for telegraphers. Therefore, a logical conclusion is that the telegraphy proficiency requirement in the Amateur service is no longer serving a public need.

12. The ARRL is currently publishing a series of articles<sup>12</sup> summarizing meetings with public service agencies around the country. At these meetings, Amateurs and served agencies are discussing their goals for the future and the kinds of communication support that they desire from Amateur Radio. Based on the published articles, the served agencies are *not requesting any use of CW proficient operators* but are instead desiring other contemporary communications modes. As we approach the 21<sup>st</sup> century, in a world awash in high tech communications, there is essentially no demand for telegraphy services by the general public *or by served government agencies*<sup>13</sup>. The Amateur service must be structured to meet the demands of the public that we serve – and should not rely on

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<sup>11</sup> The value of 72% is sufficiently large that regardless of problems with parts of the survey, we can still be confident that this is true of a large majority of Amateurs.

<sup>12</sup> QST, August 1998, page 86, QST, September 1998, page 84 and January 1999, page 70.

<sup>13</sup> According to “Served Agencies Focus on Future Needs at Midwest Regional Public Service Conference”, Rick Palm, K1CE, page 70 and 71, QST, January 1999, government agencies are desiring increased “secure” modes of communications (and specifically mention the use of packet radio technology) because of the increased concern over terrorism. Strangely, the ARRL has not suggested the use of CW (Morse code) to enhance security. Why?

flawed surveys of existing Amateurs in planning policies for the future of Amateur Radio.

The message is clear – to lead Amateur Radio into the 21<sup>st</sup> century, the requirements of the Amateur Radio Service must be re-aligned to meet the demands and challenges of the modern society that we serve. Our society is not demanding telegraphy proficient radio operators but is instead demanding skilled communications technologists. In calendar year 1998, according to FCC statistics, the number of U.S. Amateurs declined from 719,331 licensed radio to 718,241, a drop of 1090 or a .2% loss. This is the first loss in two decades and is a powerful indicator that the existing U.S. Amateur Radio Service no longer meets the demands of the public.

*The ARRL survey does not statistically support the claim that a majority of all Amateurs support the telegraphy requirement. This survey cannot and must not be used as the basis for setting public policy. The ARRL survey is “junk science”. In a June 28, 1997 letter from John Johnston of the FCC to Jim Willis, the FCC wrote: “We also note that the American Radio Relay League and the Quarter Century Wireless Association have both recently affirmed the telegraphy requirement. While the Commission would like to be of assistance to the amateur service community in arriving at a consensus, we do not believe that we could be helpful at this time.”* In these comments, I have used the ARRL’s published survey results to firmly show that *the overall Amateur community does not support the ARRL’s position.* While I have not specifically addressed the QCWA, I note that to become a member of the QCWA, an Amateur must be licensed for at least 25 years. As shown in Chart 101, the ARRL estimates that only 44% of all Amateurs have more than 21 years experience. *Therefore, we can conclude that the QCWA is a highly skewed sample of the Amateur population and is not a statistically*

*valid representation of the overall Amateur population.* The FCC is inappropriately giving extra weight to the comments of the highly skewed membership of the ARRL and the QCWA in evaluating the telegraphy requirement issue. As I have shown, the consensus opinion of U.S. Amateurs, as surveyed by the ARRL, *does not support the continued retention of a telegraphy proficiency requirement.*

**CHART 101**

Chart 101 is a copy of Figure 2 from the ARRL’s opinion survey. This chart shows the age distribution of those who participated in the survey. From this chart, we can see that somewhat less than 44% of all hams would qualify for membership in the QCWA making QCWA membership a highly skewed sample of the overall Amateur population. As such, the QCWA is not a statistically representative sample of the views of the overall Amateur population and cannot be used to extrapolate to the overall views of the U.S. Amateur population.

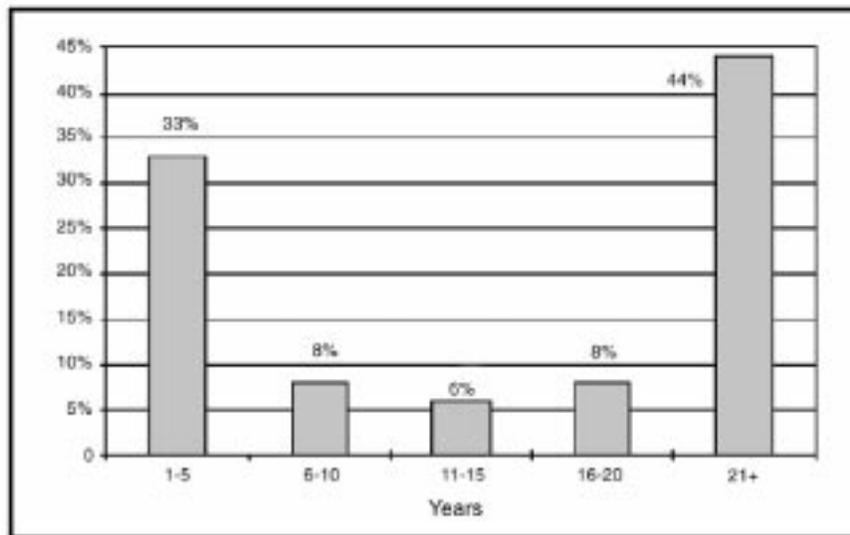


Figure 2—Length of time since receiving first license.

The Commission should reduce the telegraphy proficiency requirement to 5 wpm now, and plan for the near future when telegraphy proficiency will no longer be required by International regulations. No matter how much I enjoy the use of CW communications, the larger society that we serve does not demand this proficiency. The Amateur Radio Service does not exist to serve itself – but to serve our communities in meeting the communications challenges of the 21<sup>st</sup> century. It is time to bring the

regulatory framework of the Amateur Radio Service into the 21<sup>st</sup> century. With that in mind, I strongly endorse the proposal put forth by the National Council of Volunteer Examiner Coordinators (signed by Fred Maia) as the best proposal of several put forth by the NCVEC, the ARRL, "CQ Magazine", and by others.

Respectfully submitted by:

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