



Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

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DISCUSSION PAPER
ON A POSSIBLE RESTRUCTURING OF THE
AMATEUR RADIO SERVICE
IN CANADA

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CONTENTS

	Page
INTRODUCTION	1
1. HISTORY AND DEVELOPMENT OF AMATEUR RADIO OPERATOR CERTIFICATION IN CANADA	3
2. THE REGULATION OF AMATEUR RADIO IN CANADA	7
3. AMATEUR CERTIFICATION STRUCTURES IN OTHER COUNTRIES	9
4. CURRENT ISSUES	11
5. PROPOSALS FOR RESTRUCTURING THE AMATEUR SERVICE	13
Detailed proposals	14
Implementation	16
6. PUBLIC COMMENTS	17

INTRODUCTION

Over the years, amateur radio operation has benefitted from continuous developments in technology. By periodically amending regulations and updating the content of examinations for operators, the Department of Communications (DOC) has kept pace with these gradual changes. However, the rate of technological change has recently accelerated, and public interest in electronics, specifically high technology, has increased. This necessitated a review of the current structure of amateur certificates with respect to today's environment and the associated knowledge requirements.

Officials at DOC recently completed a review of the development of the amateur radio service in Canada, from its inception to the present, along with a review of structures in other countries. This paper provides a summary of their findings.

1. HISTORY AND DEVELOPMENT OF AMATEUR RADIO OPERATOR CERTIFICATION IN CANADA

In Canada, amateur radio was formally regulated for the first time in 1914. At that time, the examination of amateur radio operators consisted of a simple inspection of the station and a Morse code sending-and-receiving test at a speed of five words per minute. In the early 1920s, examination procedures were formalized with a written test covering regulations and simple theory and a practical test evaluating the candidate's ability to properly adjust and operate the apparatus. In the mid-1930s, the on-site practical examination was replaced by a written test to verify the candidate's ability to draw, from memory, schematic diagrams of the equipment to be operated; an oral test on the function of the various components or stages used in the design of that apparatus; and an increase to 10 words per minute in the speed of the Morse code test. Upon successful completion of the examination, the operator was issued an Amateur Radio Operator's Certificate, which permitted Morse code privileges on all the amateur bands. After a period of operation and the passing of another series of tests (Morse code at 15 words per minute, plus more-detailed regulations and theory), the amateur operator could have the certificate endorsed for radiotelephone operation.

In 1955, the procedure of granting this endorsement for full radiotelephone privileges was replaced by the issuing of an Amateur Radio Operator's Advanced Certificate.

In 1978, DOC introduced the Amateur Digital Radio Operator's Certificate, an innovation to encourage the certification of individuals whose primary interest was in computer-oriented communications. This was a departure from the traditional procedure where the only entrance examination available for a potential amateur was through acquiring the Amateur Radio Operator's Certificate. Potential amateurs, following the computer hobbyist route (obtaining this Digital Certificate), are now not required to take a Morse code examination because they conduct their experiments in the radio spectrum above 30 MHz. This is in accordance with International Telecommunication Union (ITU) Radio Regulation No. 2735.

During the consultation process leading to the Amateur Digital Radio Operator's Certificate, the possibility of introducing a Novice-type certificate (with requirements similar to those in other countries that have this certificate) was also discussed; however, in the absence of a favourable consensus, the matter was not pursued.

Since 1979, the department has been offering three certificates for amateur operation: (a) the Amateur Radio Operator's Certificate, (b) the Amateur Radio Operator's Advanced Certificate, and (c) the Amateur Digital Radio Operator's Certificate.

The examination for an Amateur Radio Operator's Certificate consists of:

- 1) a written multiple-choice test on radio regulations;
- 2) an essay-type examination on electronic theory; and
- 3) a sending-and-receiving Morse code test at 10 words per minute.

Holders of this certificate are permitted to use all types of emissions (radiotelephone, telegraphy, teleprinter, etc.) above 30 MHz but are restricted to Morse code (radiotelegraphy) operation below 30 MHz. After six months' experience, the holder of this certificate is eligible for an optional endorsement that allows radiotelephone operation in the bands 1.8 to 2.0 MHz (160 meters) and 28 to 29.7 MHz (10 meters), and frequency-shift keying emissions (teleprinter) in most of the high-frequency bands allocated to the amateur service. After one year's experience, another optional endorsement is available for fast-scan television in the band 430 to 450 MHz.

After one year of experience, the amateur is eligible to write an examination for the Amateur Radio Operator's Advanced Certificate. Although the examination for this certificate covers the same topics as the Amateur Certificate (that is; regulations, theory and Morse code), the depth of knowledge for the theory portion is greater and the Morse code test is conducted at a speed of 15 words per minute. This certificate permits the use of a full complement of emissions in the amateur bands below 30 MHz.

Eligible applicants, whose primary interests are computer communications, may write an examination for the Amateur Digital Radio Operator's Certificate, which is a "no-code" certificate (not requiring a knowledge of the Morse code). This examination consists of three parts:

- 1) a multiple-choice test on the regulations (at the Advanced Amateur level);
- 2) an essay-type test on electronic theory (at the Advanced Amateur level); and
- 3) an essay-type test on digital communications theory.

Holders of this certificate are permitted to operate using a full complement of emissions in the amateur bands above 30 MHz and, after one year's experience, are eligible to take a Morse code test, at a speed of 15 words per minute, to qualify for an Amateur Radio Operator's Advanced Certificate.

2. THE REGULATION OF AMATEUR RADIO IN CANADA

The amateur service is governed by two sets of regulations pursuant to the Radio Act:

- 1) the General Radio Regulations, Part II, (GRR II); and
- 2) the Radio Operator Certificate Regulations (ROCR).

The GRR II defines the Amateur Service as:

"... a radiocommunication service for purposes of self-training, inter-communication or technical investigation carried on by persons who are interested in radio technique solely with a personal aim and without pecuniary interest."

The GRR II regulations govern:

- 1) the use of frequencies and emissions;
- 2) necessary qualifications of operators;
- 3) interference protection to other users of the radio frequency spectrum;
- 4) apparatus and technical characteristics of amateur stations; and
- 5) general provisions such as identification procedures.

The ROCR specifies the examination requirements for obtaining radio operator certificates. The subject matter contained in these regulations is expanded upon in a syllabus for amateur certification entitled "Information on Amateur Radio Operator Examination" (TRC-24). As indicated in the TRC (Telecommunication Regulation Circular), the examination is primarily technical in content. The emphasis on the technical aspects of the hobby is not due so much to the current nature of this service, but to its past history when amateurs built their own stations.

Canadian amateurs pursue their hobby in one of the most deregulated environments in the world. As Canadian amateur licensees demonstrate that they can handle this deregulated environment with minimum day-to-day intervention from DOC, the department periodically revises the regulations to extend further privileges or delete restrictive provisions. In fact, the more than 23,000 radio amateurs in Canada cause relatively few interference complaints and demonstrate noteworthy public relations and self-policing capabilities.

One of the major reasons for this is undoubtedly the existence of local, regional and national associations and clubs. These organizations provide excellent training courses for aspiring amateurs, guidance for new operators, and remedial assistance to those operators who overstep the bounds of the regulations or good operating practices. Examples of these practices are the local television interference (TVI) committees that eliminate technical problems before they become complaints, and the "gentlemen's agreements" in current amateur operating procedures. Through such agreements, Canadian amateurs have developed their own frequency-band plans without the need for government regulation.

3. AMATEUR CERTIFICATION STRUCTURES IN OTHER COUNTRIES

The Department of Communications has collated information on amateur certification from 16 foreign countries, and has observed that there is wide variation in the various structures; one nation offers two amateur certificates, another offers five and the remainder range between those two figures. No other country issues an Amateur Digital Radio Operator's Certificate or its equivalent.

Most administrations offer a "no-code" certificate and, with one exception, permit operation under such a certificate only on Very High Frequency (VHF) and higher amateur bands. In most instances, the written portion of the no-code certificate is the same as that of the "code" certificate and an amateur may upgrade from a no-code to a code certificate simply by taking a Morse code test (in most cases at 12 words per minute). On successful completion, the amateur is issued a certificate allowing full privileges.

Many administrations offer a "novice" certificate. In most instances, the examination consists of a Morse code test at a speed of five words per minute and a simple theory and regulations test. The greatest differences appear to be in the privileges accorded to the novices. For the most part, novice operation is restricted to radiotelegraphy in small portions of the high-frequency amateur bands and some operators are further restricted to using only crystal-controlled transmitters. On the other hand, some administrations grant VHF and even high-frequency radiotelephone privileges.

In general, most administrations have three levels in their certificate structure: novice, general and VHF-only. Flexibility for the individual is enhanced by the practice of permitting a candidate to select and write any level of examination. In most countries, it is not necessary for an individual to obtain prior operating experience at an introductory level in order to be eligible to write the examination for a certificate according greater privileges. Moreover, there is no evidence to indicate that other administrations follow an endorsement procedure similar to that contained in the Canadian regulations.

Finally, there does not appear to be consistency in the maximum power levels permitted for amateur operations; levels range from 100 watts to 1000 watts d.c. input power to the final stage, with most being about 500 watts, and the majority of administrations increase the maximum power commensurate with the grade of certificate issued. Canada, therefore, appears to be one of the few nations that permits a maximum power of 1000 watts d.c. input regardless of the certificate held by the amateur.

4. CURRENT ISSUES

The primary interests of amateurs in Canada include:

- 1) public service, which includes volunteering for Emergency Planning Canada, community events, disaster preparation and message handling;
- 2) recreation, which includes participating in amateur radio contests, communicating with friends and acquaintances; and
- 3) technical experiments, which include designing and constructing equipment from magazine articles or kits, propagation studies and antenna experimentation.

There are many others, and amateurs are not restricted to any one area. Amateur radio attracts enthusiasts from various backgrounds, with a wide range in level of interest or expertise in the technical aspects of amateur radio. Because of this diversity, DOC has received suggestions for changes in a number of areas from both aspiring and existing amateurs. Morse code and technical standards are frequently mentioned, with both support for and objections to current certificate requirements.

It is suggested, for example, that a Morse code test, especially for high-frequency operation (below 30 MHz), is irrelevant now that there are devices capable of transmitting and receiving Morse code automatically, and that the Morse code requirements be waived for candidates who will equip their stations with such devices. However, it should be noted that Morse code testing is required by Canada's international obligations as a member of the ITU. We must therefore adhere to ITU Radio Regulation No. 2735, which states:

"Any person seeking a licence to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear texts in Morse code signals. The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz."

Because technology is advancing so rapidly, DOC must update the examination content more frequently and, thus, require a broader knowledge by candidates. In this respect, it has been pointed out that some aspiring amateurs, particularly senior citizens, have not had any recent formal education and are at a disadvantage in attempting to absorb the amount of material necessary to pass the technical examination. Comments received state that the technical content of the examination is inappropriate for those whose primary aim is to communicate, and that the traditional role of the amateur as a designer and builder of stations is no longer the primary activity. At present, amateurs seem to be increasingly engaged in public service and recreational communication activities using commercially manufactured and serviced equipment.

The incorporation of computer technology into amateur activities has hastened this change in role. As a result, today's amateurs have the opportunity to operate stations that are smaller, more stable, reliable and versatile than those of 10 years ago. In addition, there is heightened interest in radioteleprinters, AMTOR (AMateur Teletype Over Radio), machine-generated Morse code and packet radio communications. The increasing use of digital technology by Canadian amateurs is attributed less to the availability of the Digital Certificate than to affordable personal computers. In fact, there is a similar increase in the use of computers in amateur radio in countries where there is no equivalent to Canada's Digital Certificate. To date, only 50 individuals have entered amateur radio via the computer hobbyist route; that is, they took the examination and obtained the Amateur Digital Certificate. DOC statistics show that approximately 75 per cent of the 198 Digital Certificates issued since 1978 were to individuals who already held another amateur certificate.

Amateurs and their associations have stated that newly certified amateur operators do not have sufficient knowledge of correct operating procedures and practices, and that the examination pass-rate is too low. This low pass-rate may be attributed partly to the practice of granting candidates one year's credit for any successfully completed portion of the Amateur examination (Advanced Amateur examination credits are valid for life). Although this practice may have some merit, it tends to encourage individuals who are not sufficiently prepared to repeatedly try the examination. Nevertheless, this does indicate that too much emphasis may have been placed on the technical aspects and not enough on the operating portion of the examination.

5. PROPOSALS FOR RESTRUCTURING THE AMATEUR SERVICE

Based on the foregoing, DOC wishes to respond to the comments of both existing and potential amateurs. In so doing, any proposal that the department might implement must:

- 1) conform with the provisions of the regulations made under the International Telecommunication Convention;
- 2) not increase demands on departmental resources and, if possible, reduce these from the present level;
- 3) provide maximum benefit to an optimum number of qualified applicants, thereby encouraging radiocommunication skills; and
- 4) wherever possible, institute a general policy of deregulation that retains or enhances the role of amateur organizations.

With a view to meeting present and future requirements and in light of the foregoing, the department offers for comment a proposal to restructure its examination requirements by eliminating endorsements and the current certificates. In lieu thereof, a structure consisting of three certificates is proposed:

- 1) Certificate "A" - certifying an individual to operate a basic, commercially built, modern amateur station designed to operate on the amateur radio frequencies (privileges accorded above 30 MHz only);
- 2) Certificate "B" - certifying an individual (who also holds Certificate(s) "A," or "A" and "C") to operate below 30 MHz (Morse code test);
- 3) Certificate "C" - certifying an individual (who also holds Certificate(s) "A," or "A" and "B") to construct and operate any station or to be the licensee of a repeater or other non-standard station.

Detailed proposals

The examination to certify a candidate for the operation of a basic, commercially built, modern amateur station (Certificate "A") would consist of:

- 1) Installation and operation of modern amateur stations, including proper interpretation of meter readings such as Automatic Limiter Circuit (ALC) and Standing Wave Ratio (SWR) and the adjustments necessary to prevent interference; proper grounding techniques; and correct installation practices from transceiver to antenna, including auxilliary devices such as low-pass filters and antenna tuners.
- 2) Basic electronic theory; safety practices when working with simple circuits; tracing and correcting interference problems such as audio rectification and receiver front-end and overload.
- 3) Antenna and propagation theory, including types of antennas, feedlines and characteristics of propagation phenomena.
- 4) International and domestic regulations applicable to the amateur service.

It is estimated that approximately 40 hours of instruction would be required to obtain the basic knowledge necessary to pass this examination. Successful candidates would be issued Amateur Certificate "A" and would have the following privileges and restrictions:

- 1) The transmitter portion of the station, from the microphone or keying input of the transmitter to the final output, would have to be commercially built and marketed specifically for use on the amateur frequencies. All other components of the station, such as the receiver, filters, antennas, computer interfaces, etc., could be home-built.
- 2) No emissions would be permitted below 30 MHz, but all would be permitted above 30 MHz.

- 3) Stations would be limited to a maximum power input of 250 watts d.c.
- 4) Licensees would be limited to operating stations under their physical control, but not repeaters or remote base stations.

The examination to certify a candidate for operation in the spectrum below 30 MHz (Certificate "B") would consist of a Morse code examination at a speed of 12 words per minute.

Successful candidates would receive Amateur Certificate "B" and, providing they held Certificate "A," would operate under the same conditions as those granted by that certificate, except that they would be allowed all types of emission on any amateur band.

The examination to certify a candidate to construct and operate any station or to be the licensee of a repeater or other non-standard station (Certificate "C") would consist of:

- 1) advanced electronic theory, to augment that required for Amateur Certificate "A," with a degree of difficulty somewhere between the present Amateur and Advanced Amateur Certificates.

This would accommodate the many amateurs who are more technically oriented and wish to construct their own stations. Successful candidates would be given Amateur Certificate "C" and, provided they held Certificate(s) "A," or "A" and "B," would be permitted to:

- 1) construct their entire stations;
- 2) sponsor and operate repeaters and remote base stations;
and
- 3) operate their stations with a maximum of 1000 watts d.c. input.

Implementation

Candidates writing examinations under the above-proposed structure would be allowed to write any or all of them at one sitting. However, the minimum qualification for a station licence would be Amateur Certificate "A."

Existing amateurs holding either an Amateur Radio Operator's Certificate or Amateur Radio Operator's Advanced Certificate would be deemed by regulation to have all the privileges of the three proposed certificates, and those holding the Amateur Digital Radio Operator's Certificate would be deemed to have all the privileges for Amateur Certificates "A" and "C."

6. PUBLIC COMMENTS

Given the nature of these proposed changes, DOC wishes to obtain input from all interested parties. In framing comments on this discussion paper, the following list of questions may be helpful. However, comments need not be restricted to these points.

- 1) Are there other significant factors that may affect this proposed structure? If so,
 - (a) how could the proposed structure be improved? or
 - (b) what are your suggestions for a new structure?
Please give a detailed description.
- 2) If you are an aspiring amateur, would this new structure encourage you to become an amateur? Why or why not?
- 3) If you are currently an amateur radio operator, would the proposed structure better reflect your normal operations and the equipment used in your station?
- 4) What would be the effects upon amateur radio in the future if this structure were implemented?
- 5) Would this proposed structure accommodate special-interest groups or should the department consider the retention and extension of certificates like the Amateur Digital Radio Operator's Certificate?
- 6) Would amateur radio in Canada benefit from the introduction of a novice certificate?
- 7) If you feel positive about question 6, how could a novice certificate be accommodated within the proposed structure?

The department invites comments from all those interested in amateur radio. Persons wishing to comment may do so in writing before May 16, 1986, to:

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