Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	**)**	
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RESPONSE EFFORTS UNDERTAKEN	**)**	**PS Docket No. 17-344**
DURING THE 2017 HURRICANE SEASON	**)**	

To: The Commission
Via: ECFS Electronic Filing

REPLY COMMENTS OF THE DEPARTMENT OF HOMELAND SECURITY'S NATIONAL COORDINATING CENTER FOR COMMUNICATIONS

Public Safety and Homeland Security Bureau Seeks Comment on Response Efforts Undertaken During 2017 Hurricane Season; PS Docket No. 17-344

The Department of Homeland Security's National Coordinating Center for Communications (NCC) hereby submits reply comments on question C.8:

> *To what extent were response efforts facilitated by amateur radio operators? Going forward, should efforts be made to increase the use of amateur radio services in connection with the planning, testing and provision of emergency response and recovery communications?*

The DHS National Coordinating Center for Communications (NCC) deployed 10 high frequency (HF) radio operators to Puerto Rico in response to a FEMA mission assignment for Hurricane Maria Emergency Support Function #2 – Communications (ESF #2) emergency communications support. Of the ten, two were non-NCC federal government employees and 8 were unpaid volunteers; all are registered in our SHAred RESources (SHARES) HF radio program. All ten are amateur radio operators with a General or Amateur Extra class license. These personnel worked in two-person teams to provide amateur radio and federal government HF communications from five sites: the FEMA Joint Field Office (JFO) and four branch offices.

There were many volunteers who were federal employees who were not selected for this mission. Experience with federal government communications systems was not sufficient preparations for the mission. In our opinion, amateur radio experience was essential for the personnel on this mission to be successful.

Certain aspects of the amateur radio service provide opportunities for licensees to learn and practice skills that are not practical to develop within the duties of most federal jobs. Certain amateur radio activities involve setting up stations and operating under austere conditions, obviously relevant experience for those deploying to a disaster area.

The annual "Field Day" exercise conducted by the American Radio Relay League, Inc. (ARRL) is perhaps the best known of these activities, in which participants operate from field locations or other non-permanent radio stations with field-expedient antennas and emergency power sources (generators, solar cells etc.) for a 24-hour period in which participants seek to make 2-way radio contact by various modes (voice, CW telegraphy, and various data modes) with other participants, all without reliance on commercial infrastructure. In addition to the operator skills develop din this exercise, participants learn about the logistics necessary to perform in a field environment: generator maintenance, fuel supply planning, which tools and spare parts to have on hand, and how to make field repairs and adapt to changing requirements with limited resources.

The ARRL also promotes emergency preparedness through its "Amateur Radio Emergency Service" (ARES) program, which promotes the development of local amateur radio teams where members help each other develop emergency communications capabilities including operator skills, communications equipment that con operate in the absence of commercial power, and "go kits" of equipment and supplies ready for emergency deployment.

Many other amateur radio activities which appear to be primarily or recreational or hobby interest nonetheless exercise aspects of emergency preparedness: radio direction finding contests, operation from remote locations including islands, mountain summits, and National Parks, and radio contests occurring almost every weekend of the year focusing on various modes of transmission or operator skills.

Experimentation, or "advancement of the radio art" as it is described in the Basis and Purpose of the amateur service rules, is another aspect of amateur radio that makes it invaluable to government emergency communications. Amateur radio experimenters have developed modes of digital communications that have pushed the frontiers of weak-signal detection, waveforms optimized for various propagation and interference conditions, bandwidths, and throughput rates, error correction / error detection etc. The culture of amateur radio encourages the open exchange of information about such experiments, as well as mentoring and technical assistance to help others master these new techniques or to simply enjoy the benefits of technological advancement.

It is not so much the depth of experience that a particular individual has, but the breadth of experience common among amateur radio operators, that makes amateurs invaluable in emergency communications responses. Other commenters have documented hurricane response activities by amateur radio operators using amateur radio spectrum. We call attention to the value of the application of the skills developed in the amateur service as applied to other radio service. We agree with commenter Mark Braunstein who stated "I would encourage the FCC to view amateur radio as a learning platform for radio technology as well as an alternate means of communications should the primary means of communication fail." Technologies developed as amateur radio experimentation, and skills applying those technologies practiced in amateur radio, were extensively utilized on federal government fixed service channels. As an example, we cite the Winlink Global Radio Email system ("Winlink"). Experience gained in the amateur service using Winlink software is put to use in a Winlink network operated on federal government frequencies. Without the extensive research and development done by amateurs, sufficient expertise would not exist to maintain and operate the SHARES Winlink network. SHARES operators using Winlink and the Pactor 3 protocol on amateur spectrum and the Pactor 4 protocol on federal government spectrum observed that while much of the time voice signals were undetectable on the channels in use, Pactor 3 and Pactor 4 data communications were able to get through.

Key to the success of amateur radio is the flexibility afforded its licensees by the FCC rules, which includes among the purposes for the amateur radio service "rules which provide for advancing skills in both the communication and technical phases of the art."

In RM-11708 the Commission considers changing the rule which limits data transmissions at HF to a symbol rate which does not exceed 300 bauds. The purpose of this rule appears to be to limit the occupied spectrum of a data emission. At the time this rule was instituted, data communications were or a binary (two-state) form – on/off or mark/space keying. In a two-state waveform, the bandwidth of the occupied spectrum and the symbol encoding rate, and therefore the data throughput rate, are proportional – the more data communicated per unit of time, the broader the signal. The amount of spectrum occupied by any signal is a legitimate concern for the Commission who must manage the availability of scarce spectrum among many users.

The matter has become confused by the propensity of persons in the information technology field, using primarily wired media such as Ethernet, to describe data throughput as bandwidth. The bandwidth of a signal on a private copper path is arguably of no interest to managers of the radio spectrum, as long as the signal does not radiate beyond Part 15 limits. The bandwidth of a radio signal is, of course, a matter of concern. Newer non-binary techniques of data modulation make it possible to increase the data throughput without a proportional increase in the occupied spectrum. The Commission's rules should encourage more efficient modulation techniques that allow for greater throughput for the same occupied bandwidth, but regulation by symbol rate has the opposite effect. We note the comments of Michael J. Logan, PE: "there is not a one-to-one correlation between baud rate and symbol rate. But, artificial limits from a bygone era only hamper utilization of advance technology"; and "the throughput of digital modes can be greatly increased with no increase in the bandwidth required."

There appears to be widespread misunderstand of the differing uses of the term bandwidth between the radio spectrum and information technology fields. Many commenters express thoughts that the proposed rule change will allow for data emissions that occupy significantly more bandwidth (i.e. occupied spectrum) that are permitted under current rules. Such is not the case. Comparable bandwidths are already allowed except when a station is operated under automatic control, where a 500 Hz bandwidth limit applies – bandwidth in Hz, not symbol rate in baud. The proposed rule change would allow more data per unit of time in the SAME bandwidth (occupied spectrum). For a given amount of spectrum occupied, the same volume of data can be transmitted in less time, yielding increased efficiency in the time domain – in other words, stations could exchange their traffic faster, thereby making the spectrum available to others to use. This can be expressed as less competition for spectrum in the time domain for NO increase in the spectrum domain. This effect is affirmed in the comments of Phil Sherrod: "The use of Pactor 4 greatly increases the efficiency of sending messages via HF radio. Amazingly, it doubles the speed without increasing the bandwidth compared to Pactor 3. It's simply newer technology that allows more efficient use of the very limited bandspace allowed by Part 97.221 for automatic radio operation."

Noting the long tradition of cooperation among amateur operators using different modes, and the inherent malleability mode-based sub-band designations, we ask the Commission to take prompt action in the removal of the symbol rate restriction in the amateur service rules, and to investigate ways to be more responsive in future rule-making proceedings. The four-year pendency of this proceeding is inconsistent with the Commission's stated purpose for the amateur radio service.

Utilization of amateur radio for emergency communications varies widely throughout the United States. Significant confusion exists about the role of the Radio Amateur Civil Emergency Service (RACES, one of three radio services comprising the amateur radio service), which was created by the Commission in partnership with the Department of Defense and the ARRL. We ask the Commission to consider whether the Public Safety and Homeland Security Bureau could provide clarity on all aspects of RACES, including consideration of rule changes which might better align amateur radio emergency communications authorization with modern opportunities.

We summarize the preceding discussion as follows:

Q.: To what extent were response efforts facilitated by amateur radio operators?

A.: In addition to the direct services provided by amateur radio operators, the indirect services of technology development, operator training, and support of the SHARES Winlink network (among others) makes amateur radio an indispensable component of our national capability to prepare for, protect against, respond to, recover from, and mitigate against all hazards.

Q.: Going forward, should efforts be made to increase the use of amateur radio services in connection with the planning, testing and provision of emergency response and recovery communications?

A.: We ask the Commission to review those aspects of Part 97 of their rules relating to emergency communications, including operational and technical restrictions which limit utilization of new technologies.

Respectfully submitted,

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National Coordinating Center for Communications