DEPARTMENT OF THE AIR FORCE
AIR FORCE FREQUENCY MANAGEMENT AGENCY
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ALEXANDRIA, VIRGINIA 22331-1500

1 Jun 07

MEMORANDUM FOR ARRL

FROM: AFFMA/CC

SUBJECT: Recommended Resolution Proposal for Amateur Radio Operators

1. In response to the Amateur Radio Relay League (ARRL) proposed course of action (Atch) to resolve interference to PAVE PAWS radar from Amateur radio repeaters dated 23 April 2007, the Air Force notes the following.

a. An increase in interference to our radars in recent years prompted the Air Force to deploy an electromagnetic engineering team to conduct a survey of the electromagnetic environment around our radar sites at Beale AFB, CA and Cape Cod, MA. Following these surveys, the team identified amateur ham radio operators that are causing harmful interference to the PAVE PAWS radars. Classified reports of these surveys were forwarded to the FCC for review and resolution of the issue.

b. Following these reports, we initially attempted to work with UHF regional coordinators and several amateur ham radio operators. The effort to pursue resolution through a one-on-one interaction became too manpower intensive to effectively coordinate while still performing our national defense missions.

c. After discussions with the Air Force Frequency Management Agency, the ARRL submitted a proposal to resolve the interference issue. We have reviewed this proposal and feel it lacks the sense of urgency required to resolve the interference in a reasonable amount of time. With this in mind, we believe the following proposal will quickly resolve the interference problem to the radars and still permit amateur operators to continue operations where possible.

2. Our recommendations are:

a. ARRL and/or the FCC identify a single point of contact in the Washington DC area to handle amateur operators' questions/inquiries as we work through the issue.

b. As an interim short term solution, the Ham operators immediately reduce the power of all identified interfering sources to 5 watts. Should this not reduce the interference to a threshold deemed acceptable by the Air Force, other options may have to be reasonably

employed to include reducing antenna heights, implementation of directional mitigation techniques, etc.

c. ARRL will provide the Air Force with Longley-Rice calculations and recommended power levels for each identified Ham operator station by 15 June 2007. The recommendations will address the maximum required power of each identified repeater to prevent harmful interference to the radars.

d. Air Force will provide engineering data to ARRL and FCC by 15 June 2007, which will address the maximum required power of each identified repeater to prevent harmful interference to the radars.

e. Air Force and ARRL will review all data, calculations, and recommendations and propose any further limits, if necessary, by 30 June 2007. If there is disagreement, a telephone conference will be established to resolve any outstanding issues.

f. All interference must be resolved by 1 August 2007.

g. In August 2007, the Air Force will task our electromagnetic engineering team to revisit the two radar sites to ensure that corrective action has been taken and the interference has been successfully mitigated. We will continue to send them out periodically to ensure Ham radios are not harmfully interfering with our national defense mission.

3. We appreciate working with ARRL and the FCC in this cooperative manner and look forward to continued discussions as we work toward resolution of this issue.

GARY W. KLABUNDE, Colonel, USAF
Commander

Attachment:
ARRL Proposed Course of Action

BOOTH, FRERET, IMLAY & TEPPER, P.C.

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April 23, 2007

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Re: Interference to Pave Paws Radars from Amateur Radio Repeaters in the 420-450 MHz band; Proposed Resolution

Dear Mr. Moorefield;

On behalf of ARRL, the National Association for Amateur Radio (ARRL), I want to thank you for bringing to our attention in an informal manner the concerns of the Air Force Space Command (AFSPC) and the Air Force Frequency Management Agency (AFFMA) with respect to instances of interference between some Amateur Radio fixed repeater stations in northern California and in the vicinity of Cape Cod, Massachusetts and the Pave Paws radar (PPR) facilities located at Beale Air Force Base in California and Otis Air Force Base in Massachusetts. At the meeting at your office on March 20, 2007, Paul Rinaldo, ARRL's Chief Technology Officer, and the undersigned were pleased to have been afforded an opportunity to work together with AFFMA to resolve the concerns that AFSPC has about the Amateur Radio facilities which might contribute to reported instances of interference. The purpose of this letter is to outline for you our concerns about the nature of the problem, and as well a proposed course of action which will, we believe, resolve the problem in the quickest, least intrusive manner for all concerned. Our goal is to insure the uninterrupted operation of the two PPR facilities on the one hand, and to preserve and permit the continued operation of the existing 70-cm Amateur Radio repeater facilities on the other.

ARRL is well-aware that government radiolocation is primary in the 420-450 MHz band, and that all Amateur Radio operation is secondary, according to the Table of

Allocations (47 C.F.R. § 2.106). Furthermore, there are specific provisions in the FCC Amateur Radio Service rules for the protection of government radiolocation. 47 C.F.R. § 97.303(b) prohibits any Amateur station transmitting in the 70 cm Amateur allocation (i.e. 420-450 MHz) from causing interference to the operation of the Government Radiolocation Service. PPRs are radiolocation devices, so the interference prohibition applies. We are also aware of footnote 7 of the Table of Allocations, which limits Amateur transmitter power to 50 watts within a radius of 150 miles around both Beale and Otis Air Force Bases, for the express purpose of protecting these radars. Those obligations applicable to Amateur Radio operators being clear, it is obvious that any actual interference instances must be resolved and predicted interference avoided. We would like to assist in that process while at the same time imposing the minimum necessary restrictions on Amateur Radio repeater stations which are suspected of causing actual interference to either PPR facility.

As we understand the situation, although numerous Amateur Radio repeaters in the 420-450 MHz band (more specifically between 440 and 450 MHz) have been operating for some time near both Air Force bases with no known instances of interference, some interference was reported in mid-2006 by the Air Force. This interference was, we understand, reported to the volunteer repeater coordinators in the affected areas, and to at least some of the repeater licensees in Massachusetts at the same time. In response, the Air Force commissioned an engineering team to investigate the matter and conduct some Electromagnetic Compatibility (EMC) testing. The results of this testing, you have explained, were findings by the EMC team that fifteen (15) repeaters near Cape Cod, Massachusetts (See Exhibit A, attached) and more than one hundred in the vicinity of Sacramento, California (See Exhibit B, attached) were at least contributors to the instances of interference experienced at the radar sites. Though the total number of California repeaters which the engineering team determined were involved is not entirely clear to us, the repeaters included in the list your office provided to us total 106. The interference, which we understand causes the radar to shut down completely when it occurs (at some unspecified field strength at the PPR antenna), is said to result from in-band, FM voice, fixed repeater operation. There is limited technical information that can be made available by the Air Force concerning the interference susceptibility of the PPRs for obvious reasons. However, at the same time, some cooperation between and among the Air Force, ARRL and the affected repeater licensees and coordinators to ascertain the success of interference mitigation actions is obviously necessary. The largest obstacle presented from the Amateur's perspective is that the interference to the PPRs is neither verifiable nor quantifiable except by the PPR operators. At our meeting, it was explained to us that the willingness of the PPR operators to conduct on/off testing and other EMC testing was very limited, because for national security reasons, periods during which the PPRs are offline cannot be substantial. Absent such cooperation, however, the success of any interference resolution effort would be difficult, if not impossible, to gauge.

It is not clear what criteria, or what information, the Air Force EMC engineering team utilized in order to identify the repeaters which are alleged to be contributors to the interference problem. Indeed, now that this issue has become public information among

radio amateurs in Northern California and in Massachusetts, the question repeatedly asked of ARRL is how the repeaters were identified as interference contributors. We have no answer for them. There are certain facts which cause ARRL to believe, candidly, that the methodology used by the EMC engineering team, which has not been revealed to us, is questionable. For example, in the Otis Air Force Base list, two of the repeaters, according to Air Force representatives at the meeting, are benign relative to the PPR: WN9T and WA1YKF. ARRL has ascertained that the latter repeater is and has been off the air for some time. It is not clear why it was on the list in the first place. As to the Sacramento area repeaters, one on the list is located approximately 100 miles from the PPR at Beale AFB, and it operates at a power level of one watt. In another case, a 70-cm repeater which is on the list is co-located with another 70-cm repeater operating at identical parameters which is not on the list. Several repeaters on the California list have not used the call signs listed for several years. It would be helpful if we could determine what methodology was used in identifying certain repeaters as interference contributors. It would also be useful to know whether the licensee address was used in identifying the repeater's location, rather than the actual transmitter site coordinates, which are almost always substantially different. Finally, it would be useful to know whether or not each of the identified repeaters has been determined to be a unique interference source, or whether some are listed because they contribute to an aggregate desired-to-undesired signal level which triggers actual interference in the PPR. In asking for clarification of the ascertainment methodology, ARRL is not minimizing the obligation of the Amateur Radio community to cooperate in interference resolution.

You have kindly provided us with copies of two letters from Col. Frederick W. Mooney, Chief, Network and Information Services Division, AFSPC dated March 13, 2007 addressed to the two FCC District Directors, Thomas N. Van Stavern of Pleasanton, CA and Dennis Loria of Quincy, MA in the affected areas. The letters refer to the EMC team studies, which were apparently forwarded to the FCC, and request in essence that the listed repeaters be "given a suspense date to halt their interference to the radar." In the California case, it was requested that the repeaters be ordered by FCC to cease operations or mitigate interference by July 31, 2007, and in the Massachusetts case, by May 1, 2007. The representation was that the radio amateurs involved had been on notice of the problem for several months prior to the letters, and therefore the Air Force request should not come as a surprise. In fact, however, the repeater operators were not contacted directly, and it is not clear to ARRL that any of them, much less all, have been alerted to the interference complaint or the request to cease operation.

ARRL has, and offers the following as course of action that might more quickly bring about the cooperation of the licensees of the repeaters identified as contributors by the EMC team. We believe that it will at the same time cause the instances of interference to PPRs to be eliminated pending a permanent technical solution. It includes the following steps:

(1) All of the licensees of the repeaters on the list will be asked to reduce transmitter power output (TPO) to a maximum of five (5) watts *temporarily*, starting immediately, and until a permanent solution can be devised. This power reduction would be in lieu of a

temporary shutdown of repeater operations. These repeaters are regularly and routinely used for public service and public safety functions, including emergency and disaster relief communications. They cannot serve this function if they are inoperative. Furthermore, especially in California, these repeaters are and have been critical to providing communications to coordinate forest firefighting. If their operation and service can be preserved pending resolution of this interference issue, that would be far preferable to cessation of operation in the meantime. Since it is preliminarily apparent to ARRL that not all of the repeaters on the lists are in fact interference contributors, and that the list is overbroad, the power reduction plan for those repeaters operating at above 5 watts TPO creates a temporary solution that is fairer than a blanket cessation of operation order. I should note that some of the repeater owners have already agreed to the reduction of power temporarily in order to facilitate analysis and a solution, even without a formal plan yet in place. This indicates a strong desire to cooperatively resolve this issue informally.

(2) ARRL will conduct, with respect to each of the repeaters listed by the EMC team as contributors, Longley-Rice studies based on actual transmitter locations, actual antenna gain and height, and actual transmitter power used normally by those repeaters. These studies will reveal any applicable terrain shielding and also the calculated field strength of each repeater at the PPR antenna. In this manner, it can be determined which repeaters can continue to operate normally without modification, and which must modify their operation in order to predictably avoid substantial contribution to interference to the PPRs. The ARRL laboratory will disclose to your office the technical criteria we propose to use in drawing conclusions from the Longley-Rice (L-R) studies. ARRL has already tentatively ascertained the baseline field strength limits that should apply. We will provide that to you under separate cover prior to the commencement of the L-R studies.

(3) ARRL will make certain recommendations with respect to those repeaters which, following the L-R studies, create field strengths in excess of the maximum deemed safe for PPR radars. Those recommendations could include relocation of the repeater antenna to a lower height; creation of antenna nulls in the azimuth toward the PPR; transmitter power output reduction, or a combination of those and perhaps other factors. In the worst cases, perhaps a means of funding the relocation of the repeater to another band could be ascertained. The real problem with this step is the absence of any information as to what RF levels at the PPR antenna create a minimal interference potential. While we understand that exact information cannot be furnished, suggestion of a "starting point" standard against which you could compare the "real" safe RF level would be helpful.

(4) Those recommendations will be provided to the repeater coordinators and to the repeater licensees. Please understand that neither ARRL nor the volunteer repeater coordinator in the region has any means of compelling the repeater licensees to take any particular action. They may, in response to our recommendations, choose to conduct their own engineering showing, take other actions, or disregard ARRL's recommendations entirely. However, it is anticipated that the repeater licensees will appreciate the benefits to them of a cooperative and comprehensive approach to this matter, and we hope for a high degree of collaboration on the part of all concerned. We will, of course, provide

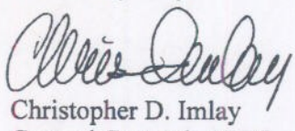
copies of the recommendations to the two FCC District Directors, and to the FCC's Special Counsel for Amateur Radio Enforcement, Riley Hollingsworth, Esquire, who is directly responsible for the current, extremely high level of compliance in the Amateur Radio Service.

(5) The participation of the PPR operators in this effort is, as briefly discussed above, critical to the success of this effort. We are hoping for feedback from both facilities with respect to the success of our temporary power reduction plan and, on an ongoing basis, in providing a critique of the conclusions from the L-R studies, to the fullest extent possible, consistent with their professional obligations and consistent with the integrity of the PPR.

If the foregoing plan is acceptable to your offices, please confirm that to us, and we will, through the repeater coordinators, disseminate the plan to the repeater licensees and commence the L-R studies immediately. Alternatively, please let us know any modifications you would propose. We are sending copies of this letter to the FCC District Directors and to Mr. Hollingsworth for their information and so that they might let us know any concerns that they have in advance as well.

Again, please accept our thanks for the helpful and cooperative approach that you have shown us to date. We understand the importance of the PPRs to National Security and will do what is necessary to insure that continued compatible sharing is facilitated in the 420-450 MHz band.

Yours very truly,



Christopher D. Imlay
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