

Hi Tom:

This may be a bit long, but since your e-mail of August 12 showed a good deal of understandable frustration, I wanted to give you a thorough response so that you can appreciate what we are all dealing with here. I also wanted to share concerns about some of the recent actions by some California repeater owners that make it appear as though they are playing “cat and mouse” with the Air Force, which is a lose-lose situation that jeopardizes Amateur access to the entire 420-450 MHz band in Northern California and perhaps elsewhere, in the future. We can’t afford that. Finally, I want to offer some suggestions in response to your specific concerns, so that we might work more cooperatively together to get the mitigation process finished and move forward with some new repeaters at 70 cm in Northern California.

Because of the details in your e-mail and wide public interest in this topic, I am including officials of NARCC in this reply. Thank you for permission to share your original e-mail in this context.

Let me detail what we have done since becoming involved in this process about 18 months ago. At the time ARRL’s Washington office heard about Pave Paws interference from the Air Force directly (not from FCC), the Air Force base commanders at Otis/Cape Cod and Beale had already proposed to FCC that Amateur repeaters near those two sites be summarily ordered off the air. FCC was considering this proposal (as they had to do) because of the absolute obligation that Amateurs have to prevent harmful interference to Government Radiolocation, the primary allocation holder in this band. FCC is permitted to observe the problems that were and are viewed by the Air Force as harmful interference, but since the interference involved military facilities, private sector individuals do not have access, which is also quite normal.

It was entirely possible, and, given the national security function of Pave Paws radars (including especially the enhanced radar at Beale) quite probable that the FCC would have had no choice at all but to shut down all repeaters (and likely, all Amateur Radio operation) within about a 150-mile radius of Beale AFB. Based on what we know now, the complaints of interference are valid, and the Air Force would have had little trouble justifying a relatively quick shutdown of Amateur operations near (and not so near) Otis/Cape Cod and Beale. Keep in mind that there is no distance limit for harmful interference. The primary user is entitled to protection from harmful interference regardless of the physical location of the source of the interfering signal.

ARRL’s meetings with the Air Force prevented an immediate shut down order from happening. It was the contact between ARRL and Air Force Spectrum Management professionals that led to something of a compromise, which, quite honestly, has not been taken too well by some of the officers at Beale (and initially by Otis/Cape Cod). The Air Force base commanders and other officers are used to faster action than has been forthcoming here, and the Pave Paws radar at Beale does continue to receive interference to the present time. Ed Hare, WIRFI, has studied what information is available about these radar systems and has ascertained that, in fact, the engineers from the 85th EIS (the technical group of the Air Force based in Mississippi that is responsible for engineering measurements, etc for their radar systems), has done their testing in a thorough and generally accurate manner using procedures that are, in our view, valid.

One thing we do have on their testing is important: They did *not* attempt to test each and every signal or possible source of interference during *each* round of testing. The 85th EIS has a limited amount of time that they can spend at any one base due to other, competing duties, so they divided their testing into periodic, separate portions. Just because a repeater was not identified on the first round does not mean it was bad testing - it may well have been tested only during a subsequent round of testing.

Of course, there is information that we simply can't have. The ARRL asked whether members of ARRL's Board of Directors who have appropriate government security clearances could have access themselves to the testing process. That was declined because in this case, access to the radar also involves a "need to know" which is not subject to waivers or accommodations. The Air Force has no real ability to allow access to private sector individuals, and with respect to missile defense systems, the level of secrecy here is understandable. So we have been working with the FCC, to make sure that the Commission is doing that which we can't do, by way of understanding and reviewing the specifics of the interference analyses that 85th EIS has been conducting. FCC has been doing that.

Some of the changes you have noted in the interference lists are due to the fact that the RF environment in the area is dynamic, and individual repeaters are not necessarily "stand alone" interference contributors. Some of the interference is an aggregate accumulation of several signals and individual contributors can be masked by others. When some sources are removed or lessened the picture can be different. The amount of mitigation required from any particular contributor different in each case and depends on many factors. There have been three different studies made of the repeater interference contributions. Each time, the environment is different, because certain repeaters have changed their operating parameters, some have not, new repeaters or operations may have come on-line, propagation enhancements may have been present that weren't at a previous time, etc.

This entire problem at Beale is a bad situation and honestly the outlook isn't going to get much better in the near term. Our lack of access to full data makes it impossible for us to fully analyze and address the issue. ARRL has done what it has been able to do toward verifying the 85th EIS work. In many cases we are able to compare the Air Force's measurements with the Longley-Rice propagation studies that WIRFI has done in order to relatively accurately predict the interference contribution from given repeaters to the radar. We have, I think, used every means at our disposal to attempt to minimize the impact of the Pave Paws upgrade at Beale on nearby Amateur repeater systems.

The Longley-Rice modeling done by the ARRL Lab has shown a relative agreement with the actual measurements presented by the 85th EIS. While there have been a few dB of difference in some cases, it has not been substantial. Remember that we do not know and we can't be told what the "bottom line" acceptable signal strength is for the Air Force at the Pave Paws Radar antenna. Knowing that would give us the sensitivity of the radar. It is important to note that in many cases the repeater owner did not provide ARRL with all of the requisite information to do a Longley-Rice model when we requested it in 2007. But I cannot remember a single case where the L-R model was so drastically different from the required mitigation request from the Air Force that the lab has said "it can't be that signal."

You indicate that there are co-channelled repeaters in your system that come up simultaneously or individually, and you fear that the Air Force does not distinguish among them and doesn't know what it is hearing. You make a good point. It would be helpful for you to provide a complete description of the linked system which can be provided by ARRL to the 85<sup>th</sup> EIS for use during any future testing.

The data/lists from which the 85th EIS has been working to date are: (1) the latest ARRL Repeater Directory; (2) individual call signs heard during monitoring and (3) unfortunately, some outdated listings. Instead of using an up-to-date listing from the start, older data was used early in their process. This is one reason some out-of-date call signs, etc have been included at times. It is understandable why use of this older data caused some amateurs to question the findings of the Air Force. When we became aware of this fact (in June 2007), we provided them an electronic version of the database. Unfortunately, instead of working only from the new data, it appears they have continued to work from "compiled" resources instead of a single, relatively accurate database. We have pointed out the problem with this, but again, we have only a limited ability to determine their testing procedures and processes.

When we have become aware of invalid call signs or data, we have presented that information to the FCC and the Air Force. But the fact remains that they have identified a specific signal on a specific frequency which is being measured and identified as being a source of harmful interference to the radar. While problems with call signs have been disquieting, it is apparent that there is a problem which must be addressed, and there is no indication that their testing is providing invalid measurements.

It has been rumored that the Air Force is basing its work only on modeling, such as Longley-Rice. That is clearly incorrect – their data is based on actual measurements made with calibrated equipment and antennas on top of the radar facility and apparently confirmed through the radar antennas. It is being performed by trained experts – both government contractors and military personnel.

You indicate that you and your group have spent many hours and dollars doing your own testing, reconfiguring your system, replacing hardware, etc. but you note that there are changes in the mitigation criteria from subsequent monitoring and new repeaters on the new list that require mitigation. It would be useful to provide the details of the testing that you folks have done, and the results of it, so that it can be evaluated by the Air Force, perhaps to your benefit; however, I suspect that the Air Force's evaluation from this latest round was in fact more comprehensive than previous instances. We have scrubbed their lists, and there have not been many discrepancies found relative to the repeaters monitored. This is not meant to discredit the work or ability of the experts with whom you are working, but again it highlights that we do not have – and will not be given – access to the complete data and testing in play at the radar site. That fact is what has made this exceptionally difficult since the beginning. There simply are few "checks and balances" in this process other than FCC requirements and, unfortunately beyond that, the Amateur Service is not entitled to consideration as a secondary user.

You suggest that someone from the Amateur's side should be involved in the 85th EIS testing. We have repeatedly asked to have an opportunity to do that, and as mentioned above, we have offered members of the ARRL's Board of Directors who are professionally involved with government radar operations and have high level security clearances. The Air Force was unable to accommodate that request. There is little to be done in that area other than to work with them to reduce the chance of errors while trying to maximize the extent to which repeater operations near Beale are left operational. At Otis/Cape Cod AFB, the problem was simpler, because the number of potentially interfering repeaters was small and more manageable. The base staff indicated that some limited on-off testing could possibly occur in the future. Ed Hare and the ARRL Lab have been at the forefront of providing advocacy for members on technical issues. Ed has worked with several groups on specific mitigation plans in hopes of keeping specific repeaters on the air. Some of these have been successful while a few have not.

We have been told that the Otis/Cape Cod situation is mitigated to their satisfaction, and in fact they are now willing to work with the coordinators and ARRL to consider new repeater coordination efforts on a limited basis in that area. In fact an agreement was recently brokered by the ARRL with Air Force and the New England Spectrum Management Council detailing a process for vetting new coordinations on 70 cm in the area around the Otis/Cape Cod site. We aren't at that point with the Beale site yet, but our goal is to eventually get there. However, the number of repeaters involved at Beale is too high and their staff is simply not in a position to dedicate resources to doing on-off testing in real time.

A better plan would be for the repeater owners to put their doubts, and the basis for them, down on paper along with the specific, technical reasons why they believe that a specific repeater's inclusion on the Air Force list(s) is inaccurate. ARRL's Longley-Rice modeling can provide a useful "sanity check" and can determine in large part whether the repeater is audible at the Beale site, or that the required mitigation is substantially incorrect. If so, ARRL can take that specific case forward to the Air Force, or in difficult cases, to the FCC for a resolution. In a specific case, where there is scientific evidence that a particular repeater is being treated overly harshly in terms of mitigation, perhaps we could persuade the Air Force to consider some on-off testing for that one repeater. But that won't be done on a generalized basis. In any case, in order for us to raise the issue formally with the Air Force or the FCC, we need specific, factual data.

You note that the testing in the heat of the summer in the valley makes for variable path losses and gain changes. While that is true, there would also be changes in the interference levels, and if tropo is causing repeaters to cause interference more than a few percent of the time, that could well cross the Air Force's threshold of what constitutes harmful interference to the enhanced radar. Also it should be noted that not all of the testing was performed in the summer – for example, the second round of testing was done in mid-late November 2007.

You note that the lists varied from test to test. Not all repeaters were tested every session – they worked about one third of the total list each visit. Since repeaters are not in continuous use, if one was not operating during the testing, it may well not have been noticed. Some have gone off the air, and some have mitigated. Changes may have been made but not reported to the ARRL in round one of testing or the FCC in round two. The extent that changes you made were not reflected in later testing would in part be dependent on the date of those changes and the 85th

EIS's testing schedule. For example, we are aware that the second round of testing (late fall 2007) was in part under way when the specific requests for mitigation were just being sent to the initial 105 repeaters in California, so some overlap occurred. If someone believes that a repeater (or more than one) has been misidentified, they need to provide to ARRL *specific* information, details and reason in writing for that concern. With proper support documentation we will carry that information to the Air Force.

You claim that some repeaters are listed twice, with different dB figures or with a call sign that has not been used for a time. First, while not in the case of your repeaters, there appears to be repeaters using the same call sign that are operating on the same frequencies – which is not a violation of Part 97. The Air Force was provided with the current Repeater Directory list in June of 2007, and an updated list in summer 2008 reflecting any changes shown in the latest version. Some of the call signs not used could still be on the repeater IDs. There are repeaters that are not IDing (which is a violation of Part 97). There are a couple of instances where a lapsed call sign was still on a repeater. There were even a couple of instances where an owner/trustee had died and the ID had not been replaced. There were a few cases in which the repeater owner had changed and the Air Force made (and/or continues to make) call sign IDs based on outdated data. This doesn't mean that the signal measurements are wrong – just that the call sign may be wrong. We have offered to review any CW identifications that they would like us to but no assistance was requested. In the next teleconference with the Air Force, ARRL will again stress the use of the newer, latest list of repeaters and again strongly encourage them to discard older, outdated lists of call signs. We will also take any specific examples of errors cited to the Air Force.

You indicate that some of the repeaters are shown 5 kHz off of the actual operating frequency. Our Lab tells me that is well within the normal margin/width of a spectrum analyzer if it is scanning the entire band. If the marker frequency was used to get the frequency, 5 kHz error is well within the range of normal. If you think that another repeater was actually monitored, we need to know specifically which one you believe was the actual one heard and the basis for that belief. The Air Force is also providing the PL tones for systems it identifies, which also helps confirm the actual identification process.

You suggest that there needs a better check and balance on the mitigation determinations. Ideally, that would be preferable to the current situation. The FCC has been invited by the Air Force to have a representative present at some of the testing. We will encourage the FCC to consider doing this for future testing. ARRL takes the position that FCC cannot formally *order* a repeater to mitigate (which it has not done in any case, so far) unless and until the licensee is provided a notice in writing of the proposed modification and the reasons for it, and a reasonable opportunity of at least thirty days to protest the proposed order of modification. This is guaranteed by the Communications Act of 1934. Fortunately for us, the Air Force is being as cooperative as they can be under the circumstances. If you believe that there are technical errors in the mitigation required by the Air Force, then by all means let us know as specifically as possible in each case why you feel that way, and we will deal with this, one case at a time. But this needs to be specific information on a specific repeater, not on the process of how they make their determinations. We believe the Air Force is acting in good faith, as is the FCC.

We have to work as cooperatively as possible on this by dealing with only technical facts. Broad generalizations are not helpful. Nor is it at all helpful for individuals to attempt to manipulate the process. For example, it was reported that one group in California (not you) had decided to turn their repeaters, which had been taken off the air, back on with a different call sign and inverting the input/output frequencies. The theory was that the Air Force has finished its testing for this year. They also claimed to have knowledge that the radar was already set-up to filter out that frequency range. This attitude is both selfish and extremely counter-productive. Also their assumption about filtering in a certain range is not correct – we asked that specific question early on in this process.

One of the reasons why Amateurs have been given the chance to resolve this without FCC action has been their willingness to accept their responsibility as secondary users. A majority of the amateurs involved are trying to resolve the matter cooperatively. If the Air Force senses a lack of cooperation or amateurs starting to play games (changing an ID or trying to avoid detection), then we all will lose.

We agree with you that fixing the wrong site doesn't help at all. If there is an apparent error, it needs to be put on the table. But you cannot expect to have an advocate for Amateur Radio looking over the shoulder of the Air Force 85th EIS team. There will not be an ARRL or Amateur Radio representative as part of the testing team. Given our status in the 70 cm band, it is important that we do what we can while not making a bad situation any worse for all concerned.

One final thought that I think we often overlook. Of the over 750 repeaters and frequencies tested, approximately two-thirds did not require any action. Of the approximately 180 identified on the first two lists, all but about 40 have been able to resolve the problem. Yes, many of those have chosen to go off-the-air, which is unfortunate if they could have remained operational at some level with specific mitigation techniques. But when you consider that 152 of the original 184 repeaters needed measured reductions or 20 dB or better (and 100 of the 184 needed a minimum of 30 dB reduction) the fact that at any of the repeaters in those ranges could remain operational on the air is significant. Is it a good situation? No, but given our secondary status in the band, it could have been, and still could be, much worse.

I again apologize for the lengthy response, but wanted to make certain to thoroughly and accurately address the concerns raised. I hope it is informative and helpful. The ARRL fully understand the concerns raised, having raised most of them with the Air Force ourselves. We also affirm our commitment to working the amateur community, FCC and the Air Force as we all continue to address this problem.

Thanks and 73

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