

APCO REPORTS

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This issue of the APCO Reports is devoted entirely to the "Options for Meeting Public Safety Spectrum Requirements" set forth by the FCC's Private Radio Bureau in its Report released August 1 in PR Docket No. 84-232, which is captioned "Future Public Safety Telecommunications Requirements". The PRB Report constitutes Phase II of the FCC's assigned task of planning for and accommodating public safety telecommunications needs. It presents the most comprehensive compilation of Public Safety communications problems, needs and potential solutions we've seen. Comments on the PRB Report are due at the Commission on October 30, and "reply" comments are due November 29. Copies of the PRB Report have been sent to all APCO Chapter Presidents, Executive Committeemen and Frequency Coordinators.

The 140-page Report will be a principal topic of discussion at the APCO/FCCA Joint Annual Conference August 26-29 in San Diego. APCO has put the PRB Report in its APCO-IS Library of available reports. Copies are available from the National Office at \$17.50 each, for prepaid orders, or \$20 each if billing is involved. The following excerpts have been edited by APCO to fit in this issue of APCO Reports. It is only one chapter of the total report.

CHAPTER 7 - OPTIONS FOR MEETING PUBLIC SAFETY SPECTRUM REQUIREMENTS

This Chapter will include discussions of a number of options for meeting the projected spectrum requirements of the public safety radio services. It is our intention to discuss each option in sufficient depth to generate constructive comments from interested parties concerning such things as the economic and technical feasibility and practicality of implementing each option. We request that interested parties analyze the costs imposed upon users and consumers by each option, as well as the value of the public safety services that each option would allow. This information will assist us in determining the option, or combination of options, which provides the greatest net benefit.

Although some of these options are clearly preferable to others, there is no significance to the order in which they are discussed. Each discussion has been designed to provide the reader with information to help make an informed evaluation of the utility or practicality of the option to meet the projected spectrum requirements of the public safety radio services. Constructive comments from the public safety community and other interested parties would be particularly helpful to the staff in the development of the Public Safety Plan to assure that future Public Safety communications requirements are met.

OPTION 1: Review of the proposed allocation of the 900 MHz reserve spectrum

On November 21, 1984, as part of the series of previously discussed actions allocating the 32 MHz of paired land mobile reserve spectrum at 900 MHz, the

Commission adopted three Notices of Proposed Rule Making. General Docket No. 84-1231 proposed allocating 12 MHz of spectrum at 845-851 MHz and 890-896 MHz for use by common carrier cellular radio systems; General Docket No. 84-1233 proposed allocating 12 MHz of spectrum at 896-902 MHz and 935-941 MHz for use by the private land mobile radio services; and General Docket No. 84-1234 proposed allocating 8 MHz of spectrum at 821-825 MHz and 866-870 MHz for land mobile satellite service use. A review of the proposed allocating of that reserve spectrum vis-a-vis the needs of the public safety radio services is one available option. Several alternatives exist. First, the Commission could reallocate all or part of the 12 MHz designated for cellular use to the public safety services. Second, the Commission could apportion a greater percentage of the 12 MHz designated for private use to the public safety services. Third, the Commission could reallocate all or part of the 8 MHz designated for mobile satellite service (MSS) use to the public safety services.

To amplify, as discussed earlier, the Commission proposed allocating a portion of the remaining land mobile reserve spectrum for additional use by cellular radio systems. The proposed allocation is in two 6 MHz blocks, one of which is adjacent to the spectrum currently allocated to the private land mobile radio services. There is the standard 45 MHz separation between the two blocks. The spectrum would be useful to public safety entities because it has the same separation as existing 800 MHz private land mobile operations and because some of the channels are contiguous to current private land mobile spectrum. Reviewing the proposed allocation in order to designate some or all of that spectrum for public safety use would be one option to meet the future requirements of the public safety community.

Chapter 5 discusses in depth the proposed release of 12 MHz of reserve spectrum to the private land mobile radio services. The channel assignment scheme proposed in that docket would make 30% of the channels available to the Public Safety pool. The Notice solicited comments on the division of frequencies and requested input as to whether the public safety portion should be larger than proposed. One option available would be to apportion a greater percentage of the spectrum, up to 100%, to the public safety radio services and give less or none of the spectrum to other private radio service users.

A third option would be to re-evaluate the proposed allocation for MSS use and reallocate the proposed spectrum for public safety use. The 8 MHz of spectrum proposed for MSS use is unique in that it is available nationwide and is contiguous to the existing private land mobile radio frequency allocation of 806-821 MHz and 851-866 MHz, two specific requirements which the Congress directed us to address. Moreover, many private land mobile radios currently used in the 800 MHz band have the capacity to operate on the frequencies proposed for MSS. Thus, if the frequencies 821-825 and 866-870 MHz were allocated to the public safety radio services, these services could get immediate relief from spectrum congestion by using the existing, off-the-shelf inventory of 800 MHz private land mobile radios.

In determining the proposed allocations of the 900 MHz reserve spectrum, the Commission weighed numerous factors before deciding on the apportionment proposed. Because the 900 MHz reserve proceedings are still pending, comments concerning these options submitted in response to this Report will be considered only in terms of the broader scope of this proceeding.

Option 2: Reallocation of Domestic Public Land Mobile Radio Service spectrum to the public safety radio services

Just as there are private land mobile radio frequency allocations in the 150 MHz, 450 MHz and 470-512 MHz bands, there are likewise allocations in these bands for the Public Land Mobile Service. Wireline common carriers and radio common carriers (RCCs) use frequencies in these bands to provide public land mobile service

Wireline common carriers and radio common carriers (RCCs) use frequencies in these bands to provide public land mobile service to subscribers. . .

Nationwide, there are 18 frequency pairs available for two-way service in the 150 MHz band, and 26 frequency pairs available in the 450 MHz band. In the 470-512 MHz frequency band, containing the existing land mobile/TV sharing frequencies on UHF-TV channels 14 through 20, either 24 or 12 frequency pairs are available for radio common carriers to provide public land mobile service in 13 selected cities.

In the 150 MHz and 450 MHz band, all allocated frequency pairs are used for two-way and one-way services in all major metropolitan areas. Because of the relatively few frequency pairs available, no frequencies remain unused in any major metropolitan area. Prior to the advent of cellular systems, the demand for mobile telephone service in the major markets in the 150 MHz and 450 MHz bands was so great, and the degree to which mobile telephone systems were loaded so high, that the point had been reached where paradoxically the growth of the mobile telephone systems had reached the limiting point of no growth. That is, for each additional mobile telephone service subscriber on a system, another subscriber of the system left it because channel congestion had so severely degraded the quality of the mobile telephone service. In 1979, the waiting list for mobile telephone service in the Washington-Baltimore area was seven years long.

The frequency pairs available in 11 major cities for public land mobile service in the 470-512 MHz band are all used by consortia of RCCs who provide two-way mobile telephone service.

The initiation of cellular radio service in many large metropolitan areas has served to reduce much of the backlog of demand for mobile telephone service in major metropolitan areas. However, it remains to be seen to what extent the growth of cellular radio replaces existing mobile telephone service in the 150 MHz, 450 MHz, and 470-512 MHz bands.

From a practical standpoint, the use of common carrier allocations to relieve public safety spectrum congestion may not be a viable option. Theoretically, the public safety community could receive spectrum relief by employing all unused common carrier allocations throughout the country because common carrier land mobile systems employ the same frequency bands as private land mobile systems. However, in all metropolitan areas where public safety authorities face spectrum shortages in the 150, 450 and 470-512 MHz bands, there are no common carrier frequencies available. Generally, in those areas where common carrier frequencies are unused, there is no shortage of spectrum for public safety authorities. Even if common carrier frequencies were available in those areas where there is a shortage of public safety spectrum, the number of 150, 450 and 470-512 MHz band common carrier frequencies is too small to make a significant difference in meeting public safety communications needs. Also, were the common carrier frequencies to be reallocated to the public safety services, the economic disruption to the wireline telephone companies and the radio common carrier industry would be severe.

Option 3: Reallocation of existing Private Land Mobile Radio Services Spectrum below 470 MHz to the public safety radio services

As discussed in Chapter 2 of this Report, the use of spectrum below 470 MHz has evolved gradually over the past 30 to 60 years. Land mobile radio, as it is known today, did not really come into being until after World War II. In 1945, the Commission reallocated spectrum above 25 MHz for use by the land mobile services as they then existed. During the mid-1950's to mid-1970's the private land mobile radio services grew very rapidly, creating frequency congestion in highly populated

areas. Consequently, portions of the UHF-TV band were reallocated for land mobile use.

Land mobile radio usage has increased over the years in relation to advances in radio equipment technology. Early land mobile allocations and frequency usage were primarily in the 25-50 MHz band. Public safety is currently allocated 54% of the assignable frequencies in this band. Land mobile radio equipment was next developed and implemented in the 150-174 MHz band. Public safety is presently assigned 45% of the channels in this band. Mobile radio equipment was then developed for operation in the 450-470 MHz band. Public safety acquired only 23% of the assignable frequencies in this band because they had to compete with other land mobile services which were growing faster than the public safety radio services at that time.

As frequency congestion successively increased in each of the allocated bands, land mobile radio users moved to higher frequencies in accordance with spectrum allocations and advances in equipment design. Land mobile licensees have been able to move up in frequency to escape severe congestion or to expand their communications capabilities. However, the availability of the new channels and equipment designed to operate at higher frequencies have resulted in the fragmentation of communications systems that many individual licensees now operate.

The reallocation of all existing available private land mobile spectrum below 470 MHz to the public safety radio services could substantially accommodate the telecommunications requirements of public safety. Table 1 of Chapter 2 indicates that public safety currently has 42% of the overall total of available private land mobile channels in the bands below 470 MHz. Much of the demand for additional spectrum for public safety could be met on the remaining 58% which is allocated to the non-public safety services. Reallocation of this spectrum would be advantageous because the lower frequency bands would:

- support wide area communications systems since they are less affected by propagation anomalies;
- provide contiguous spectrum and thus substantially reduce fragmentation or duplication of radio systems as would be the case if channels were made available from other bands;
- eliminate the need to employ expensive, untested technologies which could prove operationally fatal and cost prohibitive to public safety users who are limited by restricted budgets;
- make operationally feasible the expansion of existing systems and which could use a single piece of equipment that could operate on any available frequency in a particular band; and
- make it possible for a piece of equipment used in a system in one area of the country to be used, with simple adjustments, anywhere.

It is clear that the exercise of this option would be extremely disruptive and would have a severe adverse economic impact on over half a million existing non-public safety private land mobile spectrum users. For the same reasons that available radio channels in the bands below 470 MHz are advantageous to public safety, they also appear to be the most practicable for many other private land mobile users. Although these services may not be considered as high a priority category in terms of the Congressional directive, they do play a most significant and vital role in contributing to the economic growth, productivity and well-being of the U.S. For example, power utility radio systems are used to monitor and control

plan facilities which generate, transmit and distribute electrical energy, gas, water and steam. These systems help to ensure the availability of essential utility services to the public on an uninterrupted basis and in the most economic and efficient manner possible. Petroleum and natural gas industry radio systems are used to accommodate the centralization of pipeline facilities operations. Telemetry circuits provide temperature, rate of flow, pressures and on-off functions. Private land mobile radio systems help to provide the nationwide railroad network with reliable means of control movement of trains, coordinate train operation, and enhance the safety of the public and railroad employees. Other non-public safety users such as highway transportation, heavy construction, airlines, newspapers, manufacturers, road builders, small and large businesses, educational and a host of other industrial fields use private land mobile radio systems to help ensure the effective and efficient availability of critical public services.

To accomplish the suggested reallocation would require that existing non-public safety users relocate to spectrum above 470 MHz and employ new, more costly equipment to meet their mobile communication requirements. Further, additional spectrum would have to be made immediately available to meet the vital communications needs of the business community.

Option 4: Reallocation or sharing of federal government spectrum for use by the public safety radio services

Another option available to meet the needs of the public safety community is the reallocation or sharing of federal government frequencies. Currently, the federal government has frequency assignments in the 162-174 and 406-420 MHz bands. Its land mobile radio use is confined primarily to those bands. The federal government has in exclusive land mobile assignments above 800 MHz, nor does it have the same access to those bands that local government and public safety entities have. For example, the federal government is not an eligible as defined by Part 90 of the Commission's Rules. Because Specialized Mobile Radio (SMR) systems are only available for use or operation by eligible users, the federal government is precluded from operating or subscribing to an SMR system.

The federal government currently shares some frequencies with non-government users. The 420-430 MHz band is used primarily by federal government radiolocation stations with secondary use by non-government radiolocation and amateur stations. Action taken in the 1979 World Administrative Radio Conference (WARC) would allow land mobile and fixed use of the 420-430 MHz band in the United States on a shared basis with radiolocation and amateur radio facilities. On April 15, 1985, the Commission adopted a Notice of Proposed Rule Making in Docket No. 85-113 which proposes to allow portions of the 421-430 MHz band to be used by private land mobile licensees in the Detroit, Cleveland, and Buffalo areas. Such operation appears to be feasible because government radiolocation transmitters are not currently located at fixed sites in these areas, and because the government has indicated its willingness to avoid authorizing any such new assignments. As noted in that proceeding, recent negotiations with Canada, which plans to use this band primarily for land mobile and fixed operations, have yielded an agreement concerning proposed land mobile use in the United States. The proposal would provide some land mobile relief in three major urban areas where spectrum is congested due to restricted use of both the 470-512 and 800 MHz bands near the Canadian border.

Many of the frequencies assigned to the federal government are used for national security and other high-priority functions. Therefore, it may not be feasible for federal government bands to be shared or made available to public safety users. Further, the incompatibility of voice communications with other operations, such as radiolocation, may make sharing an unfeasible solution to the current public safety spectrum problem. However, there may be value in discussing shared operations

on government frequencies for certain public safety functions. This would be particularly useful for certain disaster situations which cross jurisdictional lines.

Option 5: Reallocation of at least two UHF-TV channels to the private land mobile radio services in selected geographic areas

In Chapter 5 of this Report, we examined the issue of the expansion of land mobile/UHF-TV sharing as proposed in General Docket No. 85-172, as well as the Commission proposal in General Docket No. 84-902 to allocate one UHF-TV channel for use by the Public Safety Radio Services in the Los Angeles, California area. The sharing proposal would provide 12 to 36 MHz of spectrum that could be used for the private land mobile radio services, including public safety operations, in eight of the most congested urban areas. A subsequent proceeding will deal with the apportionment of this spectrum among the various private land mobile services. Further, a supplemental proposal in that docket would not be restricted to the major urban areas and, if adopted, could provide added relief to the public safety community.

The spectrum requirements of all the private land mobile radio services must be considered in any land mobile/UHF-TV sharing proposal. Further, existing or authorized full power UHF-TV stations should not be adversely affected. With these premises, it would not be possible to provide a national allocation of contiguous spectrum for the public safety radio services. Comments are solicited on the appropriate amount of this spectrum which should be made available for public safety use.

Option 6: Mandate narrower bandwidth technology in the Private Land Mobile Radio Services and phase out existing equipment

It is clear that the public safety spectrum needs could be partially satisfied, in theory, if the Commission were to mandate use of more spectrally efficient technology in the existing allocations. The conversion process, however, could be extremely disruptive, time consuming and costly. This would be especially true in the case of public safety licensees who are limited by budgetary constraints and bound by the vital need to maintain operationally effective and efficient communications systems. It has taken over four decades for the private land mobile radio services to progress to the current state of technological advancement. The economic investment made in telecommunications equipment during this period by the private land mobile community, including the public safety community, is estimated to be billions of dollars. Public safety agencies are very reluctant to allocate funds for a new technology until it has been sufficiently tested to prove its capabilities in meeting the demanding operational requirements of public safety radio systems. Because public safety organizations are funded by tax dollars, it is highly probable that any action requiring the scrapping of existing telecommunications equipment and the immediate employment of advanced spectrum saving technology would be strongly opposed by the public safety community. Similar adverse reactions would be expected as a result of the effect of implementing this option on the thousands of businesses currently operating in the Private Land Mobile Radio Services. Additionally, the public safety community is very reluctant to use any equipment that has not been used by other private radio services for several years. A gradual phase-out of existing equipment after it was fully depreciated would certainly be more economically palatable than prematurely phasing out hundred of millions of dollars worth of land mobile equipment, the longer the period of time public safety would have to wait for this option to help meet their future spectrum needs.

Option 7: Increased use of existing common and private carrier communications capacity by public safety entities

Several options and alternatives are available to the Commission to meet the telecommunications requirements of public safety authorities. Among them is the option of utilizing existing capacity on the systems of others. There are various possibilities open in this regard. First, using common carrier facilities; second,

using Specialized Mobile Radio (SMR) systems; and third, using Subsidiary Communications Authorizations (SCA). In each instance, the public safety entity would act as a customer and not a provider of the telecommunications system. The inherent disadvantages to these alternatives are lack of complete system control, inability to ensure top priority of use, and loss of security with regard to interception of messages.

The feasibility of using private or common carrier facilities to satisfy some of the public safety telecommunications needs was specifically raised in the Notice of Inquiry in this proceeding. The majority of commenters responded that those facilities could only be used for very limited non-emergency purposes. Some did not see any possible use of those systems. The most often cited disadvantages to using private carrier or common carrier facilities were the loss of system control, loss of secure communications, and the relatively high cost of the service.

Common Carrier

The Association of Maximum Service Telecasters noted that common carrier facilities are currently being used by public safety entities for point-to-point communications. They state there is "no reason why some portion of public safety mobile telecommunications requirements could not also be accommodated on either private carrier or common carrier facilities. The rapid development and growth of cellular telephone systems in major metropolitan areas confirms that at least some non-emergency public-safety mobile telecommunications needs can be satisfied by common carrier mobile telephone service."

The International Association of Fire Chiefs (IAFC) surveyed its member organizations regarding whether their mobile radio communications requirements could be provided by a common carrier. In response to that survey, forty-seven of fifty four responded negatively. Of the remaining seven, six stated that some of their non-emergency requirements could be met by common carriers. One respondent did not express an opinion. IAFC, in its comments, submitted the following responses from public safety authorities which underscore the quantitative result:

Loss of operational control of your communications by depending on a common carrier or for-hire radio service would be unacceptable. Dependence on an outside entity to provide suitable maintenance, redundancy, coverage and adequate channel access time in such a critical area would have a negative impact on your operational effectiveness. Although non-emergency communications may be less critical, its importance in the operation of a Public Safety Agency should not be minimized. Its use in training, maintenance, and in support in emergency situations make it a vital tool which should be protected from deterioration. . .

California Office of Emergency Services also commented that they currently use common carriers for some communications. In assessing their satisfaction concerning that use they state that "public safety demands dependable, non-fail communications. Unfortunately common carriers are not always responsive to our needs."

The Bureau of Statewide Emergency Telecommunications (Connecticut) noted that the possibility of public interference and lack of communications security could be significant. The City of Rialto commented that they do not think it is feasible to accommodate public safety requirements on private or common carrier facilities. "It is necessary that the cities have the ability and capability to restore service and public safety cannot depend upon a common carrier to restore circuits in the time required for emergency operations. The common carrier has diverse responsibilities." This concern for dependability during emergencies was echoed by Office of Telecommunications of the State of California. . .

In conclusion, common carriers appear to be primarily useful for non-emergency administrative communications. The need for secure communications, immediate access to the system and lack of system control render this option an undesirable alternative for most public safety requirements.

Specialized Mobile Radio Systems

The same characteristics that limit the usefulness of the common carrier option lessen the feasibility of using SMR systems or SCA systems. . . . Because the SMR system licensee is an entrepreneur, the same disadvantages that applied to the common carrier usage are present here. Levels of congestion acceptable to business users leasing capacity on an SMR system may be intolerable to public safety users. Even routine radio communications have the possibility of turning into emergency transmissions and delay in accessing the system could mean a threat to life or property. Consequently, public safety entities require immediate access to their telecommunications systems. . . . These conflicting interests may make the use of SMR systems unfeasible for all but the most routine matters which do not have the possibility of escalating into emergency situations. For those routine matters, the use of SMR systems may be a feasible alternative for public safety needs.

Subsidiary Communications Authorizations

A third option is the use of SCA's (FM Subcarriers). Under Commission Rules, an FM station may offer unused spectrum to Part 90 eligibles. Possible uses by public safety entities include paging or signalling and point-to-point or point to multipoint information distribution. Again, because an entrepreneur is providing the service, the conflicting goals of the SCA operator as provider and the public safety entity as user that apply to common carrier and SMR usage apply here. This option, therefore, may be a feasible alternative for routine administrative matters, but not for emergency communications. In conclusion, for routine, non-emergency administrative matters the use of common carrier, SMR and SCA systems provide a feasible alternative to public safety entities providing their own telecommunications systems. However, for the vast majority of public safety telecommunications requirements, these options may not provide a viable solution to the needs of the public safety community. In sum, the use of common carrier, SMR and SCA systems appears unfeasible for all but a small percentage of public safety requirements.

Conclusion

A final judgment on the economic, technical, or operational feasibility of each option will await comments to this Report. Comments are solicited especially on the anticipated time frame within which each of these options could, if implemented, provide relief to existing and projected congestion problems in the eight largest markets as well as the remaining thirteen market discussed in the Report. Further, it is expected that additional options will be proposed by public safety entities or other interested parties in response to this Report. All feasible options will be considered by the Commission staff prior to the development of the third and final phase of this project - a plan which assures that the future telecommunications requirements of public safety entities will be met.

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The APCO National Office staff will be attending the 1985 Annual Joint Conference of APCO and the Forestry, Conservation Communications Association in force during the period beginning Friday, August 23 and ending Friday, August 30. During that period, the National Office in New Smyrna Beach, Florida, will be operated by a skeleton staff. The Office will be back into full operation on Tuesday morning, September 3.