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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554
STOP CODE: 1170

Re: PR Docket No. 93-61
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems

Dear Mr. Caton:

Yesterday, Pinpoint Communications, Inc. ("Pinpoint"), filed its Reply Comments to Comments on Ex Parte Presentations. Due to unforeseen photocopying difficulties, two Exhibits to the Reply Comments were not attached thereto. Attached herewith for inclusion in the docket file are five copies of the date-stamped Reply Comments (one stamped "Original" with an original declaration associated with Exhibit 1), with complete Exhibits.

Pinpoint respectfully submits that no party will be prejudiced by the acceptance of the Exhibits. The Exhibits respond in detail to certain criticisms regarding Pinpoint's ARRAY™ radiolocation and data messaging network and clarify matters concerning the ability of wide-area automatic vehicle monitoring systems to share spectrum, one of the central issues in this proceeding. Accordingly, their acceptance will help complete the record upon which the Commission may base its decision in this difficult proceeding.

Respectfully submitted,

By _____
Edward A. Yorkgitis, Jr.
Counsel for Pinpoint

Enclosures
cc: Parties filing comments in response to February 9, 1994, Public Notice (DA 94-129)

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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
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Amendment of Part 90	)	
of the Commission's Rules	)	PR Docket No. 93-61
to Adopt Regulations	)	
for Automatic Vehicle	)	
Monitoring Systems	)	

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MAR 29 1994
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

**REPLY COMMENTS OF PINPOINT COMMUNICATIONS, INC.
ON COMMENTS ON EX PARTE PRESENTATIONS**

John L. Bartlett
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Its Attorneys

March 29, 1994

SUMMARY

Based on the record developed in this proceeding, the Commission can achieve its objective articulated in its Notice of Proposed Rulemaking ("NPRM"): to "promote the efficient operation and continuing growth of Automatic Vehicle Monitoring ("AVM") systems." Final rules should be adopted that open the entire 902-928 MHz band to AVM systems. These rules should be predicated on sharing, and contain the elements described below and detailed in Pinpoint's Comments on Ex Parte Presentations and the attached Reply Comments.

First, wide-area systems should share the entire 902-928 MHz band on a time-sharing basis pursuant to negotiated arrangements among all technically and financially qualified system applicants in each market. In this way, the Commission can maximize the potential total throughput capacity for the wide-area allocation and the number of competitors. The number and types of AVM systems that survive would be left to the marketplace. Under time sharing, individual systems can determine their own bandwidth, the protocol for use of the spectrum by mobiles, the amount of spectrum to be used by and the nature of forward links, return links, and incidental data messaging. Limited numbers of emergency voice channels at the edge of the 902-928 MHz band could be made available for wide-area systems, but more extensive voice capabilities should be supported by one of the many Commission allocations for such purposes.

Pulse-ranging hyperbolic multilateration systems are inherently suited to time sharing because they operate using disparate short-duration pulses. Thus, while all wide-area

systems, including Pinpoint, will have to compromise to accommodate time sharing, they are capable of doing so. Time sharing is not only feasible, it is the best way to promote competition, diversity, and continuing innovation in wide-area AVM. Pinpoint has addressed the criticisms of PacTel Teletrac and Southwestern Bell Mobile Systems to time sharing in its Comments on the Ex Parte Presentations and in earlier pleadings. Appended to these Reply Comments is an Exhibit countering the simplistic technical arguments of MobileVision against time sharing that were contained in an Annex to MobileVision's comments on the *ex parte* proposals.

The band plan proposals of other wide-area systems are blatantly self-serving and would lead to exclusive licensing to a very small number of systems. These licensees would be forced to adopt restrictive bandwidths that would seriously compromise the potential radiolocation capacity in this band and stunt innovation. If the proponents of exclusive licensing cannot otherwise be satisfied, they should be encouraged to bid for spectrum in one of the Commission's upcoming auctions. Other developers, such as Pinpoint, that recognized the need to design a system capable of operating in this shared spectrum environment, should be permitted to remain.

Second, the Commission should permit wide- and local-area systems to share the entire band. Pinpoint has demonstrated through its experimental operations and tests conducted with AMTECH Corporation, a local-area system developer that wide-area and local-area systems are compatible. Mobilevision's criticism of these tests demonstrates a surprising inability to differentiate between the mere detection of another system's signal and the presence of destructive interference. That wide-area and local-area systems can share on

a co-primary basis is also evidenced in the comments of other wide-area and local-area system providers. Nonetheless, should the FCC segregate the band to accommodate certain wide-area systems unable to share with local-area systems, as required by the current rules, the Commission should permit those wide-area systems that can share to do so in the remaining part of the band without foreclosing their ability to use the wide-area only spectrum as well.

Third, the Commission should affirm the legitimate role all users in this shared band plan, including ISM devices, government radiolocation, amateur radio, and Part 15 devices, in addition to AVM. Part 15 devices should be permitted to continue consistent with the non-interference conditions subject to which the FCC originally "encouraged" their operation. Pinpoint, as a developer of AVM systems in the 902-928 MHz band, designed its ARRAY™ network to tolerate a reasonable level of interference, including that from Part 15 transmitters. Part 15 devices need not inevitably be an unmanageable source of interference to its operations.

Just as Pinpoint designed its system with the need to coexist with Part 15 devices in mind, designers and developers of Part 15 devices even more so should be required to do the same with respect to AVM systems consistent with their obligations to avoid harmful interference to licensed systems and to tolerate interference received from the same. Nonetheless, Pinpoint believes that an appropriate balance of the interests of wide-area systems and Part 15 devices to use the band is in the public interest. Specifically, Pinpoint sets forth herein an objective, quantitative definition of "harmful interference" for purposes

of Part 15 and wide-area AVM systems. The definition recognizes as a practical matter wide-area systems must tolerate a certain amount of radio noise from Part 15 devices.

The Commission has previously recognized that if Part 15 systems are unable to operate consistent with the Part 15 rules, they should seek authority under one of the licensed services. There are generous amounts of spectrum in which unlicensed spread spectrum and other Part 15 operations may operate authorized (including 40 MHz just authorized for unlicensed Personal Communications Service), or obtain licenses in the authorized services.

The 902-928 MHz band, however, is the best spectrum home for high-capacity AVM due to the favorable propagation characteristics for mobile operation and the ability to use bandwidths of 16 MHz and above. Furthermore, an allocation of 26 MHz for wide-area AVM will permit reliable, accurate operation in *urban* environments and integrated non-voice signalling -- capabilities not offered by Loran C or GPS systems.

In addition, Pinpoint has no objection if the Commission were to limit wide-area systems in the band to the location of vehicles and equipment typically associated with transportation, such as freight containers and tractor trailers.

Finally, in the attached "Response to MobileVision's 'Technical Review,'" Hatfield Associates, Inc. ("Hatfield"), refutes MobileVision's distortions of Hatfield's "Review and Discussion of the Pinpoint's ARRAY™ Network and Performance." Contrary to MobileVision's assertions, the Pinpoint system has a range consistent with spectrally efficient radio systems. In fact, upon closer analysis, the range of the ARRAY™ Network is expected to exceed that of MobileVision by as much as a factor of two. Moreover, the sensitivity of the Pinpoint TransModem is more than sufficient in the interference-limited operating

environment of 902-928 MHz, and is far better than the level MobileVision claims. Finally, MobileVision misconstrues the Hatfield Report to suggest that the location accuracy of the Pinpoint system is only two hundred feet, when in reality Pinpoint's field tests show the accuracy to be within 30 feet about ninety-five percent of the time.

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Before the
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Washington, DC 20554

In the Matter of	)	
	)	
Amendment of Part 90	)	
of the Commission's Rules	)	PR Docket No. 93-61
to Adopt Regulations	)	
for Automatic Vehicle	)	
Monitoring Systems	)	

To: The Commission

REPLY COMMENTS OF PINPOINT COMMUNICATIONS, INC. ON COMMENTS ON EX PARTE PRESENTATIONS

Pinpoint Communications, Inc. ("Pinpoint"), by its attorneys, hereby replies to the comments filed in this proceeding in response to the Commission's Public Notice dated February 9, 1994.[1] The record in this docket demonstrates the public interest in expanding the allocation for automatic vehicle monitoring ("AVM") systems to include the entire 902-928 MHz band. The Commission now has the information it needs to adopt final AVM service rules that are conducive to a diversity of AVM system designs -- both wide-area and local-area -- and a vigorous wide-area AVM marketplace. The final rules should build upon sharing concepts that have operated in this band for two decades among wide-area AVM systems, between wide-area and local-area AVM systems, and among all users of this band, including industrial, scientific and medical ("ISM") devices, government radiolocation systems, amateur radio operators, and Part

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[1] *Regulations for Automatic Vehicle Monitoring Systems*, Public Notice, DA 94-129, 59 Fed. Reg. 7239 (Feb. 15, 1994).

15 devices. However, the final rules must take into account the advances that have been made in efficient high-capacity wide-area system design in the past several years.

I. FINAL RULES SHOULD PROMOTE THE EFFICIENT OPERATION AND CONTINUING GROWTH OF AVM SYSTEMS AS WELL AS ACKNOWLEDGE THE RIGHT OF OTHER LEGITIMATE USERS TO UTILIZE THIS BAND

The Commission instituted this proceeding to adopt final AVM rules that would promote the "efficient operation and continuing growth of Automatic Vehicle Monitoring ("AVM") systems."[2] To assist it in that process, the Commission solicited comments on numerous issues, including the following, which in this proceeding have proven to be central:

- The FCC's intent to incorporate sharing among wide-area systems into the final rules, if feasible, so as to promote competition to the greatest extent possible.[3]
- In light of the increasing demand for spectrum by both wide-area and local-area systems, the Commission sought comment on methods by which wide-area and local-area systems could share the same spectrum.[4]
- Given that the 902-928 MHz band has been serving the needs of not only AVM systems, but ISM devices, government radiolocation, amateur radio, and unlicensed Part 15 devices, the Commission expressed its intent to maintain an appropriate balance among these uses.[5]

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[2] *Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems*, Notice of Proposed Rulemaking, 8 FCC Rcd 2502 (1993) ("NPRM").

[3] *Id.* at 2505-06.

[4] *Id.* at 2505.

[5] *Id.* at 2506-07.

The record developed in this docket to date enables the Commission to meet its objectives. First, sharing among wide-area systems is feasible, both as a technical and economic matter. The Commission can maximize the potential total throughput capacity for wide-area AVM systems, as well as benefits of competition, by ensuring that the entire 902-928 MHz bandwidth is available for their use on a shared basis. Exploiting the tremendous capacity advantages of a wide bandwidth, a number of systems can share the band successfully through a certain, but limited, degree of technical cooperation to effectuate time sharing and -- if desired -- a combination of such sharing with frequency division and/or code division multiple access ("CDMA"). The number and nature of systems ultimately constructed and competing with each other will be left to the marketplace.

Under a time-sharing approach as envisioned by Pinpoint, an individual system designer can determine the bandwidth appropriate for the services it intends to provide, the protocol for use of the spectrum by its own mobiles, the amount of spectrum to be used by and the nature of forward links, return links, and incidental data messaging. No system would be precluded from combining its AVM service with voice communications available in many allocations the Commission has already made to both private and common carrier land mobile radio, and a *limited* number of *emergency* voice channels could be made available in the 902-928 MHz band. The only compromise, one that would be common to all wide-area systems sharing the spectrum, is that an individual system may not be able to use the spectrum to which it is licensed on a continuous basis. The fact that operation of pulse-ranging hyperbolic

multilateration is predurated on short duration pulses, however, makes wide-area AVM systems inherently suited to this restriction.

Second, local-area and wide-area systems can share the same spectrum. Through cooperation, licensees can minimize the potential for interference on their operations and its impact when it occurs. This is evidenced by the experimental test results of Pinpoint,[6] the test results of PacTel,[7] and the comments of local-area system operators.[8] Further, by implementing a band plan characterized principally (albeit not necessarily exclusively) by spectrum sharing between local-area and wide-area systems, the Commission will maximize the flexibility of system operators to choose frequencies and to adopt system designs with bandwidths appropriate to their capacity needs.

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[6] *See* Hatfield Associates, Inc., "Review and Discussion of the Pinpoint ARRAY™ Network and Its Performance," at 6-1 to 6-3, filed as an *ex parte* presentation in PR Docket No. 93-61 on January 24, 1994 ("Hatfield Report"). As discussed below in Section IV and in the "Hatfield Response to MobileVision's 'Technical Review'" ("Hatfield Response to MobileVision"), attached hereto as Exhibit 1, MobileVision's criticism of the Pinpoint field tests is seriously flawed because it equates the detection of another system's signal with destructive interference and ignores the methods by which interference that does occur can be overcome. *See also* Comments of Pinpoint Communications, Inc., PR Docket No. 93-61 at 27-31 (filed June 29, 1993) ("Pinpoint Comments (June 1993)") (discussion of steps available to mitigate potential interference from local-area systems).

[7] As Pinpoint discussed in its earlier reply comments filed in this proceeding on July 29, 1993, PacTel attached a study to its June 29, 1993 comments that, through PacTel's own field results, illustrated the feasibility of sharing among wide-area and local-area systems. *See* Reply Comments of Pinpoint Communications, Inc., PR Docket No. 93-61 at 50-53 (filed July 29, 1993; corrected August 3, 1993) ("Pinpoint Reply Comments") *discussing* PacTel Teletrac, "Theoretical and Field Performance of Radiolocation Systems" at 10-13 and Figure 9 (June 25, 1993) submitted as appendix 2 to Comments of North American Teletrac and Location Technologies, Inc. (PacTel), PR Docket No. 93-61 (filed June 29, 1993) ("PacTel Comments").

[8] *E.g.*, Comments of AMTECH Corporation on *Ex Parte* Presentations, PR Docket No. 93-61 at 3 (filed March 15, 1994) ("Comments of AMTECH on *Ex Partes*"); Comments of Mark IV IVHS Division, PR Docket No. 93-61 at 7 (filed March 15, 1994) ("Comments of Mark IV").

Finally, the Commission should affirm the legitimate role all users in the 902-928 MHz band play in serving the needs of the American public consistent with the principles of sound spectrum management. Pinpoint, for one, recognizing the heavy use of this band by a variety of users, including Part 15, has designed its systems to tolerate expected sources of interference within reasonable bounds. In light of the multi-layered allocations in effect in this band over the past two decades, sound engineering required no less. Pinpoint submits that the Commission can legitimately demand that all users of this band tolerate certain levels of interference consistent with their respective regulatory status and the Commission's delicately balanced allocation scheme. Accordingly, for example, wide-area systems should receive protection from secondary users of the band, but only when the secondary users are raising the noise and interference level in the AVM receiver above a certain objective level with a certain frequency.

Following these guidelines, the Commission may act at this time to adopt final rules for AVM in the 902-928 MHz band while maintaining the viability of the operations of *all* users of this band. Pinpoint respectfully submits that the FCC should adopt the band plan proposed by Pinpoint in its recently filed comments in response to the Public Notice[9] or that proposed in its original comments.[10]

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[9] Comments of Pinpoint Communications, Inc. on Ex Parte Presentation, PR Docket No. 93-61 at 25-32 (filed March 15, 1994) (Pinpoint Comments on Ex Partes).

[10] Pinpoint Comments (June 1993) at 31-39.

II. THE ENTIRE 26 MHz SHOULD BE ALLOCATED FOR USE BY WIDE-AREA AVM SYSTEMS ON A TIME-SHARED BASIS

The record in this proceeding makes clear the significant potential public interest benefits arising from a thriving, competitive wide-area AVM marketplace. While other radiolocation systems exist (e.g. Loran and GPS), their capabilities are deficient in comparison with wide-area AVM in the urban marketplace. To maximize the public benefits from the 902-928 MHz band and competition among wide-area systems, the FCC should enable such systems to use, on a shared spectrum basis, the entire band. As Pinpoint noted in its recent Comments on *Ex Partes*, the Commission may determine limited band segregation of wide-area systems from local-area systems may be in the public interest because of the inability of some wide-area systems to tolerate such interference.[11] However, such segregation in part of the band should not preclude sharing by wide-area systems with other users in the remainder of the band.[12]

A. The Record Demonstrates the Need for Opening the Entire 26 MHz to AVM

In its *NPRM*, the Commission recognized the myriad benefits from AVM systems concluding that "it is imperative that our rules provide a competitive and

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[11] Pinpoint Comments on Ex Partes at 6.

[12] This position is supported by PacTel. *See* Pactel Comments on Ex Partes at 11 n.11.

dependable environment in which AVM systems can continue to develop."[13]. Among other things, the agency noted the important role that AVM systems will play in the development of intelligent vehicle-highway systems ("IVHS"). The record in this proceeding is replete with reference to and illustration of the many vehicular radiolocation and related needs that wide-area AVM systems will serve in the near future, including commercial and governmental fleet monitoring and dispatching, traffic control on our nation's ever busier highways, roadside emergency assistance, in-vehicle traveler assistance, and in-vehicle warning systems.[14] The number of parties, including Pinpoint, that have invested millions of dollars into the design and development of ranging vehicle location systems is also testimonial to the substantial interest in these systems. Similarly, there is considerable interest and effort in the development and deployment of local-area systems, as evidenced by the Comments of AMTECH Corporation, Hughes, AT&T, Mark IV, and TI/MFS. Concomitantly, there is a call by the entire industry for more spectrum than that amount allocated under the

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[13] 8 FCC Rcd at 2503.

[14] *See, e.g.*, Reply Comments of the United States Department of Transportation, PR Docket No. 93-61 at 7-11 (filed July 29, 1993); Pinpoint Reply Comments at 4-5; PacTel Comments at 7; Comments of MobileVision, L.P., PR Docket No. 93-61 at 13-16 (filed June 29, 1993) ("Comments of MobileVision (June 1993)"); Comments of IVHS America, PR Docket No. 93-61 at 8 (filed June 29, 1993) ("IVHS America Comments"). As described in Section III below, Pinpoint believes that the AVM allocation should be dedicated primarily, if not exclusively, to uses related to vehicular transportation. It would not be in the public interest to expand the use of this band to the purely monitoring services suggested by Southwestern Bell (*see* Comments of Southwestern Bell Mobile Systems, Inc. (Southwestern Bell), PR Docket No. 93-61 at 5-6 (filed June 29, 1993)(monitoring vending machine inventories, industrial appliances, air conditioning units, and gasoline terminals)), the personal locator services suggested by PacTel (PacTel Comments at 7-8); or the cellular/PCS-like services championed by MobileVision (MobileVision Comments on Ex Partes at 16), as these would render it difficult or not impossible for this band to help meet this nation's IVHS needs.

existing rules for the operation of these systems. In sum, the record evidences the need to expand the existing interim allocation in the 902-928 MHz band to encompass the entire band.

An expanded allocation for AVM is necessary to accommodate the many new and existing applications of AVM technology. As Pinpoint has explained many times in this proceeding, maximum capacity, and hence optimum band utilization, can be achieved by permitting wide-area systems to operate on as much contiguous bandwidth as possible.[15] In addition, local-area AVM systems and users have explained the need for flexibility in choosing frequencies due to the sources of interference in this band, as well as the need for spectrum to accommodate multiple channels for wideband local-area systems, such as that being implemented throughout California.[16] The inevitable conclusion, therefore is that wide-area and local-area systems should each be permitted to operate throughout the entire band on a shared basis. Pinpoint recognizes that the Commission may want to segregate some of the band for AVM use by wide-area systems only and has no objection provided that the spectrum available to local-area systems on a primary basis is also available for wide-area system licensees on a co-

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[15] *See e.g.* Pinpoint Comments on Ex Partes at 21; *id.*, Exhibit B; Pinpoint Comments (June 1993), Exhibit A: "The relationship between Position-Fixing Rate and Occupied Band Width in AVM Systems" by Louis Jandrell.

[16] *E.g.*, Comments of AMTECH on *Ex Partes* at 4; Comments of Mark IV at 7; Comments of Texas Instruments, Inc./MFS Technologies, Inc., PR Docket No. 93-61, at 14-15 (filed June 29, 1993).

equal basis, as Pinpoint described in its comments in suggesting modifications to the PacTel *ex parte* band plan proposal.[17]

Some parties have questioned the need for an expanded allocation for AVM.[18] These parties suggest that the vehicle location services to be provided by wide-area systems are already available from other services, such as Loran C and the Global Positioning Service ("GPS"). However, unlike GPS and Loran C, only wide-area AVM at 902-928 MHz can offer a comprehensive solution to the need for *accurate*, *reliable* location services in *urban* areas, the environment in which radiolocation systems stand to offer the maximum benefit to the public.

Loran C technology was initially developed for coastal navigation. Although increasingly applied to terrestrial operations, it remains highly susceptible to interference from powerline carriers and atmospheric noise, particularly in urban areas.

GPS, while satisfactorily accurate, is not a reliable solution in many locations because an unobstructed view of the sky in the concrete canyons of an increasing number of our cities is often unavailable. Further, unlike AVM, these alternatives require combination with a separate system to exchange location data and vehicle-related data with a central processing point. Only wide-area AVM in the 902-928 MHz band permits the transfer of vehicle-related data within the ranging signal and

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[17] Pinpoint Comments on *Ex Partes* at 2-4 & n.7.

[18] *See, e.g.*, Comments of Part 15 Coalition, PR Docket No. 93-61 at 3 (filed March 15, 1994); Comments of Itron, Inc., PR Docket No. 93-61 (filed March 15, 1994) at 5; Comments on *Ex Parte* Communication of Bay State Gas Co., *et. al.*, PR Docket No. 93-61, at 8 (filed March 15, 1994) ("Comments of Ad Hoc Utilities Coalition").

therefore allows for efficiencies in system design that can be passed on to consumers in the form of reduced prices for equipment and service.

Other commenters supporting Part 15 devices suggest that wide-area AVM systems be allocated spectrum in other frequency bands, such as the spectrum around 2400 MHz recently recommended for transfer from the federal government.[19] However, the 902-928 MHz is the only band available that is appropriate for high capacity AVM systems in furtherance of the important national goals for IVHS. In addition, unlike the bands suggested by AVM's detractors, 900 MHz is far more suitable for mobile operations. As Pinpoint has explained throughout this proceeding, the enormous capacity gains from operations using bandwidths of 16 MHz and greater are needed to serve adequately the needs of IVHS in our largest metropolitan areas.[20] For this reason, the allocation of the 10 or 15 MHz bands suggested by some other parties as a home for wide-area systems (2300-2310, 2390-2400 and 2402-2417 MHz), in lieu of 902-928 MHz, would disserve the public interest.

Comments seeking the forced migration of wide-area AVM systems appear to be motivated by a concern that such AVM systems will be overly susceptible to interference from Part 15 devices and as a matter of course, will seek the cessation of

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[19] *See e.g.*, Comments of Part 15 Coalition at 6; Comments of the TIA Mobile & Personal Communications Consumer Radio Section, PR Docket No. 93-61 at 10 (filed March 15, 1994) ("Comments of TIA").

[20] *E.g.*, "Response to Comments Filed in PR Docket No. 93-61 Concerning the Adoption of Final Regulations Governing Automatic Vehicle Monitoring," by Louis H.M. Jandrell, Vice President, Design and Development, Pinpoint, at 1-8 submitted as Appendix B to Pinpoint Reply Comments ("Technical Appendix"); Pinpoint Reply Comments at 46-47.

operation of such devices. As described in Section III below, the shared nature of this band dictates that wide-area AVM systems should be designed to tolerate a certain amount of interference from Part 15 devices and other sources of noise in the band. In fact, Pinpoint agrees with PacTel that it may be appropriate to develop an objective yardstick by which to determine when harmful interference to AVM systems occurs, as discussed more fully below.[21]

In conclusion, a permanent allocation for wide-area AVM systems in the 902-928 MHz band would serve the public interest. The spectrum needs of such systems, and the ability of sound and cost-effective designs to permit sharing between wide-area and local-area AVM systems, suggest that the best course is to make the entire 26 MHz band available for AVM.

B. The Commission Should Implement Time Sharing Among Wide-Area AVM Systems Pursuant to Pinpoint's Proposed Sharing Rules

The submissions in this proceeding from wide-area AVM system licensees demonstrate that there is a diversity of wide-area system designs. This variety foreshadows a healthy marketplace for wide-area AVM services provided that the final

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[21] Designers, manufacturers, and vendors of Part 15 devices must recognize that any encouragement given to the development of such devices was tightly coupled with need to avoid interference to licensed services in the bands in which they operate. *See* discussion in Section III.A.1., *infra*. Conversely, just as wide-area systems will have to tolerate a certain amount of interference from local-area systems, amateurs and Part 15 devices, operators of Part 15 devices will have to expect some interference from wide-area systems. However, while wide-area AVM systems may cause some interference to Part 15 devices, there is no evidence in the record that such devices generally will not continue to be viable; indeed, several parties, including TIA and Metricom faut the general robustness of Part 15 devices.

rules accommodate that diversity, as Pinpoint submits they can.[22] To achieve this objective, and thereby encourage true competition and allow for future development in the provision of such services, some compromise probably will be required by all system operators. Accordingly, the Commission should seek to maximize the capacity of this band to accommodate competition among these diverse systems while requiring the minimum amount of compromise as a whole.

Not surprisingly, each wide-area system licensee commenting in this proceeding has presented a band plan to accommodate its own system. However, none but Pinpoint recognizes the need for compromise if the FCC's objectives in this proceeding are to be met. The proposal favored by each wide-area commenter, except Pinpoint, would give the proponent thereof exclusive access to a 4 or 8 MHz bandwidth of spectrum.[23] In all but the case of Pinpoint, the band plans would arbitrarily limit the

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[22] The Commission has traditionally fostered a variety of approaches to meet the needs of the American public. The adoption of spectrum band plans in the face of such diversity is a difficult task, but one the FCC is charged with under the Communications Act. The attempts by some Part 15 proponents to prevent a final allocation to AVM in the 902-928 MHz band in light of the diversity of AVM systems amount to a request that the Commission abdicate its statutory responsibility. *See e.g.* Comments of TIA at 7-9; Additional Comments of American Telephone and Telegraph Company, PR Docket No. 93-61 at 3-4 (filed March 15, 1994).

[23] PacTel would accord each of the two users exclusivity to 2 MHz of spectrum (1.5 MHz wideband forward link and two 250 kHz sub-bands of narrowband forward links). PacTel's *ex parte* proposal would also ostensibly provide for sharing by two wide-area system licensees in 6.5 MHz of spectrum. Apart from certain rudiments concerning housekeeping functions, which will compromise a very small percentage of airtime, and allusions in its recent comments to statistical spatial diversity, PacTel has not sufficiently explained how this sharing would occur. Thus, it may be that the PacTel ex parte "sharing" plan is, as some commenters suggest, *e.g.*, Comments of MobileVision on Ex Partes at 22, merely another effort to obtain exclusivity. For its part, MobileVision would have the FCC choose two incumbents now -- one of which, of course, would be MobileVision -- and foreclose the potential for future development of AVM by new entrants. *Id.* at 31.

number of licensees to two or four without any showing that this small number of providers is sufficient to provide for a competitive marketplace.[24]

While Pinpoint's bandplan is also constructed to accommodate its system, the ARRAY™ system alone was designed from the start to accommodate sharing of the band.[25] Thus, the Pinpoint plan, in contrast with those of others, would lead to the maximization of the vehicle location (and data messaging) capacity of the band and the accommodation of any financially and technically qualified entity interested in providing wide-area AVM. The two principal elements of Pinpoint's scheme are time-sharing and the opportunity for occupied bandwidth limited only by the boundaries of the band, *i.e.* 902-928 MHz. As amplified below, Pinpoint's proposed sharing regulations will accommodate a larger number of aspects of existing systems than any of the competing band-plan proposals.[26]

Notably, Pinpoint itself will be compromised under its band plan in at least several ways. First, Pinpoint would prefer not to be subject to competition, or at least to cap the number of potential competitors as would PacTel (one), MobileVision (one),

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[24] Pinpoint Reply Comments at 19-31. As Pinpoint discussed in its Reply Comments, procedures injecting effective open entry are necessary to ensure the development of a competition marketplace.

[25] As discussed above, the other systems could accommodate sharing by virtue of the short-pulse nature of hyperbolic multilateration. While the desire of the proponents of exclusivity to walk away from this proceeding with a spectrum windfall, such a result need not occur in order for the public to gain the benefits of a diversity of competitive approaches to meeting AVM needs in this the only band that can readily accommodate high speed wide-area terrestrial AVM.

[26] Indeed, because sharing is accomplished on a time division basis, a new entrant could theoretically always be accommodated in a given market, despite the presence of existing licensees. The potential for additional entry would serve as a spur to existing licensees to improve their efficiency for the time they have access to the spectrum, promoting competition and the public benefits therefrom even further.

and Southwestern Bell (three) in their proposals.[27] However, in a given market, its plan could lead to four, five or more competitors.

Second, Pinpoint would prefer not to have to share spectrum with local-area systems. But it cannot realistically expect to do so under a plan that maximizes the capacity of the band for high-capacity AVM purposes. Under Pinpoint's time-sharing approach, all 26 MHz would be available to each and every individual wide-area system, although individual systems could choose to use less. The weight of the evidence in the record, including the comments of Pinpoint, PacTel[28] and MobileVision[29], and even Southwestern Bell[30], is that increases in bandwidth yield even greater gains in capacity, such that four systems sharing 16 MHz on a strict frequency division basis cumulatively will derive no more than one-fourth of the capacity that four systems sharing 16 MHz of spectrum on a simple time-shared basis,

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[27] Southwestern Bell, which suggests that frequency division alone constitutes the "sharing" of spectrum, essentially attempts to reduce, through this distortion of the term "sharing," the Commission's inquiry into the feasibility of sharing into a meaningless gesture. The Commission is well aware that twice as many entrants can be introduced into a given frequency bands if the channel size per licensee is halved. However, this does not constitute sharing of spectrum consistent with the agency's inquiry. In fact, the difference between the band plan proposed by Southwestern Bell (divide 16 MHz of the 902-928 MHz band into four 4 MHz channels for wide-area system licenses) and the rule changes supported by MobileVision (two exclusive 8 MHz wide-area system licenses per market) is simply a matter of degree. If the Southwestern Bell plan constitutes sharing, so, too, does the MobileVision plan. As MobileVision states clearly in its recent Comments, its plan categorically does not involve sharing. (If it did, the Commission would not have asked if sharing is feasible.) Neither does Southwestern Bell's plan.

[28] PacTel Comments at 23.

[29] Comments of MobileVision on Ex Partes at 25.

[30] *See* discussion in Pinpoint Comments on Ex Partes at 21.

and potentially even less.[31] If the bandwidth is increased to 26 MHz, the overall capacity increases even further. By maximizing capacity, the Commission can maximize the number of entrants and therefore competition.

Finally, while Pinpoint would prefer no competition and the opportunity to use fully its licensed spectrum, it realizes that only on a time-shared basis can the maximum capacity of the band be exploited by the greatest number of systems. In contrast, as noted above, all other wide-area proponents have advanced band proposals that would give them an exclusive license in the bandwidth of their choosing.[32] Pinpoint explained in detail in its earlier comments that the conversion of existing licenses granted under a shared spectrum regime to an exclusive status raises serious questions under the venerable *Ashbacker* doctrine.[33] If these parties are intent upon obtaining exclusive licensing, Pinpoint submits that they should be required to do so pursuant to the competitive bidding process in another band, and that the 902-928 MHz band should be reserved for shared use and high capacity AVM systems on bandwidths in excess of 8 MHz.

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[31] As noted above, despite Southwestern Bell's claims to the contrary, its "sharing" proposal does not involve sharing. At most, its plan addresses the inquiry of the Commission into how much spectrum is necessary for a wide-area system to operate. *NPRM*, 8 FCC Rcd at 2503. While an AVM system could be constructed to operate within the 2 MHz utilized by Southwestern Bell, this narrow bandwidth is obtained only with a precipitous loss of capacity from that enjoyed by systems of 8 MHz, 16 MHz, and even larger bandwidths.

[32] MobileVision accuses PacTel of promoting a plan in its *ex parte* designed to preserve PacTel on its currently licensed frequencies. MobileVision Comments on *Ex Partes* at 20. Ironically, MobileVision in its recent comments offers a plan apparently designed solely to keep PacTel off of its currently licensed frequencies, since MobileVision -- which incidentally has no commercially operating systems -- would itself have to move.

[33] Pinpoint Reply Comments (June 1993) at 31-45.

Under the Pinpoint plan, each system would have to accommodate time-sharing. Because each hyperbolic multilateration system is designed to locate vehicles through radio pulses of short duration, each is *inherently* amenable to modification for time sharing. While each system, including Pinpoint's, will suffer a loss of capacity as a result of time sharing, the significance of that loss will be directly related to the capacity of the original system design. In other words, systems designed to yield a small location capacity will be affected the most. Therefore, time sharing is an incentive to increase system capacity or, conversely, a catalyst assisting the marketplace in weeding out inefficient designs.[34]

The latest round of comments fails to undermine the feasibility of time sharing. MobileVision attempts to characterize time sharing as injurious to wide-area AVM operation, but as explained in the attached Exhibit 2, MobileVision's concerns do not lead to the consequences claimed.[35] Other commenters merely rely upon conclusory statements or earlier arguments, which Pinpoint has already refuted in detail.[36] MobileVision's real concern about time sharing is not its feasibility but the impact

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[34] While it might be argued that licensees in a limited bandwidth authorization would have an incentive to develop and employ more efficient methods to increase their capacities -- curiously the advocates of exclusive licenses have *not* made this argument -- the public policy deficiency in that contention is that in a subdivided band in which licenses are limited to only 4 or 8 MHz bandwidths, the total capacity of the band will have been compromised such that an individual licensee would brush up against less generous limits than if the licensees shared the entire 26 MHz on a time-sharing basis. Importantly, the same argument regarding incentives to efficiency can be made if licensees have access to the band for a limited percentage of the total time, as under Pinpoint's proposal.

[35] *See*, "A Response to MobileVision's Annex 3: Time Sharing Considerations," by Louis H.M. Jandrell, Pinpoint, attached hereto as Exhibit 2.

[36] *See, e.g.*, Pinpoint Reply Comments at 5-19; *id.*, Technical Appendix, at 22-32.