Exhibit 1

Response to MobileVision's "Technical Review"

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MobileVision, a potential competitor of Pinpoint Communications, Inc., for the provision of automatic vehicle monitoring (AVM) services, has filed a criticism of the Pinpoint ARRAY™ system as we reported it in "Review and Discussion of the Pinpoint ARRAY™ Network and Its Performance" (Hatfield Report). In our review of the Pinpoint system, we found it to be well-designed and considered its operation effective, both in its radiolocation and data messaging functions.

MobileVision's criticism falls into three broad categories: 1) range and receiver sensitivity; 2) location accuracy; and 3) susceptibility to interference from local-area systems. As the following discussion demonstrates, MobileVision has misinterpreted and distorted the Hatfield Report to reach erroneous conclusions. In fact, the range of the Pinpoint ARRAY™ system is expected to exceed that of MobileVision. Further, the generally high level of interference in the 902-928 MHz band will almost certainly limit effective receiver sensitivity. Even though the inherent TransModem receiver noise figure is well below the level computed by MobileVision, the fact that operation in this band is interference-limited means that the basic receiver sensitivity is not an important issue. Moreover, the location accuracy of the Pinpoint system is within thirty feet 95% of the time. Finally, when one makes the fundamental distinction between detection of the signal of another system and harmful interference, as MobileVision failed to do, one sees that the potential for interference from local-area systems is quite manageable.

1. The Pinpoint system has effective range and more than adequate mobile receiver sensitivity for operation in the 900 MHz environment.

MobileVision claims that the Pinpoint system has limited range and poor mobile receiver sensitivity. This erroneous claim is based on MobileVision's failure to grasp that the operation of spectrally-efficient systems, such as Pinpoint's, is interference-limited, not noise-limited. Interference-limited networks restrict the coverage of individual base stations to permit frequency re-use over local market areas. (Below we show that Pinpoint's range is significantly better than that of MobileVision as described in its Annex 5 to its Further Comments in the AVM Rule Making of the Federal Communications Commission.) Hence, they are limited by co-channel and other types of interference. A general rule of thumb in the mobile industry is that spectral efficiency quadruples each time the base station coverage radius is halved. MobileVision erroneously implies that a longer coverage radius is inherently superior to a shorter radius and that Pinpoint would require four times as many base stations as the MobileVision system would need in the same application. If one were to apply

MobileVision's logic, then regarding mobile telephony, for example, conventional high-power systems would be superior to cellular systems with equivalent frequency allocations.

For a given mobile system, the capacity of a base station is essentially fixed, so that the capacity and spectrum efficiency of a system are proportional to the number of base stations needed to cover a given service area. Thus, MobileVision's claim that its system has greater coverage range and needs fewer base stations than does the Pinpoint system runs counter to the important spectrum efficiency requirements the Commission has to weigh in considering the public interest. Also, the positioning accuracy of a radio location system increases as base stations are more closely spaced, an important consideration to system users, especially public safety organizations.[1]

As regards mobile receiver sensitivity, MobileVision[2] misconstrues the Hatfield Report to conclude that "the Transmodem unit has a sensitivity of -85 dBm."[3] Although the Hatfield Report stated that this was the "nominal" Transmodem receiver sensitivity, the statement was based on the expected interference environment[4] the Pinpoint system will encounter at 900 MHz. The Report also observed that "the interference levels in the band are expected to create a noise floor of about -85 dBm. Hence, the test is representative." A sensitivity below a certain level does not improve things because external interference, and not front end noise, limits performance.

The Hatfield Report explained that "commercial TransModems are expected to have better sensitivity." In fact, in the laboratory environment, the receiving sensitivity of the Pinpoint TransModem radio is much better than -85 dBm. The TransModem radio uses a front end containing a 2 dB noise figure low noise amplifier (LNA) with 20 dB gain. Laboratory measurements show that the overall receiver noise figure is less than 6 dB and the sensitivity of the experimental receivers is approximately -100 dBm or lower.

Not only is external interference a limiting factor, but there is also an engineering

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[1] Although all ARRAY™ network base stations are capable of transmitting, generally only one in a cluster of base stations transmits at any time. Furthermore, the cluster definition is dynamic and is determined by the coverage required for each mobile. This was explained in detail in the Hatfield Report.

[2] References are to Annex 5 of MobileVision's March 15, 1994, Further Comments in the AVM Rule Making Docket, unless stated otherwise.

[3] Subsection 1.3 -- Signal Strength

[4] A relatively high noise floor is expected in the 900 MHz AVM band because of interference from other systems, especially from the proliferating Part 15 devices that operate in the band.

tradeoff between receiver sensitivity and associated dynamic range: Increasing receiver sensitivity increases the dynamic range of the power levels the receiver must deal with, and this makes it more and more difficult to prevent receiver front end overload. A receiver thus can be too sensitive for the application at hand.

MobileVision also claims that the Pinpoint system has an inadequate jamming margin of only 5 dB. MobileVision completely misunderstands how the Pinpoint system works. As one result, MobileVision claims that Pinpoint's jamming margin is only 5 dB when, in fact, it is very much larger.[5] As was explained in the Hatfield Report, Pinpoint's spreading sequences contain 127 chips, and this determines the processing gain of a single sequence. In a 127 chip sequence there can be as many as 127 orthogonal codes or sequences.[6] For a position fix, sixteen such sequences contribute to the signal arrival time estimate. Thus, the overall processing gain is nearly equal to the number of chips in the transmitted sequence times the number of correlator outputs that are averaged together. The processing gain can be considered to be equal to 127 times 16, or 33.1 dB. If one assumes a required detector output signal-to-noise ratio of 10 dB, using MobileVision's definition, Pinpoint's jamming margin for position fixes is equal to 23.1 dB, considerably above the 5 dB asserted by MobileVision.

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[5] Whether or not a particular jamming margin is bad is arguable. The answer depends on a large number of factors. It is important to note, as was stated in the Hatfield Report, that Pinpoint and Amtech have shown that the two systems can coexist with minimal impact on either system, suggesting that the jamming margin is adequate.

As with most design parameters of a communications system, there are many tradeoffs. An important one relating to the jamming margin is the capacity, and associated spectrum efficiency, of the system. In a spread spectrum system, an increase in the processing gain leads to an increase in the jamming margin; the tradeoff, however, may be a very significant decrease in system capacity. In order for a spread spectrum system to achieve high spectrum efficiency, a balance must be struck between processing gain and frequency reuse as well as between susceptibility to various external forms of interference and interference caused to other systems. The 902-928 MHz band contains a high level of background noise from a large number of sources, and this needs to be taken into account when considering transmitter power so that a reasonable balance of communications ranges can be maintained.

[6] It is important to note that the number of bits Pinpoint encodes into each of the 127-chip sequences does not affect the processing gain.

In MobileVision's Section 1.1, Experimental Network, the processing gains and chipping rates for the MobileVision and Pinpoint systems should have been calculated as follows:

For the MobileVision system,

processing gain = 255, or 24.1 dB,
and the chipping rate is 2 Mchips/s.

For the Pinpoint system,

processing gain = 127 x 16 = 2,032, or 33.1 dB,
and the chipping rate is 11.536 Mchips/s.

Substitution of these correct values into the equation MobileVision used to derive the ratio of the ranges of the two systems shows that, at a given radiated power, MobileVision's system has only 0.91 times the positioning range of the Pinpoint system, instead of the 2.99 times they erroneously claimed.

In fact, Pinpoint proposes to use 40 W mobiles, while MobileVision plans to employ 5 W mobiles. If one takes the difference in mobile transmit power into account, the calculations show that the Pinpoint system has 1.99 times the range of MobileVision's system. Thus, on balance, the Pinpoint system has essentially twice the range of the MobileVision system instead of only one-third the range as MobileVision incorrectly claims.

MobileVision misleadingly states that its system's 200 W narrowband command channel is reliably received by mobiles in excess of 20 miles in southern Florida in comparison with a claimed three mile range for the Pinpoint system in Washington, D.C. It is well known that most of southern Florida has extremely flat terrain[7] and that downtown Washington, D.C. is an urban area with a moratorium on building and antenna heights that makes transmitting signals into and out of the "canyons" more difficult than in urban areas having a normal mix of building heights, let alone in open terrain.

Propagation loss for open terrain (such as that in southern Florida) at a given distance is much less than that in urban areas (such as downtown Washington, D.C.). At a frequency of 900 MHz, a base station antenna height of 200 feet and a mobile receiver antenna height of 6 feet, a well-known reference shows the excess propagation loss (that is, the loss over that for

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[7] The Commission's Rules recognize this fact explicitly and state that, "[i]n Dade and Broward Counties, Florida, average terrain elevation is assumed to be 10 feet." 47 C.F.R § 22.115(c)(1)

free space) for open terrain at a distance of 32.2 km (20 miles) is approximately 24 dB. For urban terrain at this distance, the excess propagation loss is 52 dB.[8]

At 4.8 km (3 miles), the excess propagation loss in urban areas is 38 dB. Note that this is 14 dB more than the excess propagation loss at 20 miles for MobileVision's southern Florida case. The free space path loss at 20 miles is 16.5 dB greater than the free space path loss at 3 miles; thus, the received signal strength at a distance of 3 miles in an urban environment is only 2.5 dB greater than the received signal strength at 20 miles in an open terrain environment like that of southern Florida.

Taking into account the external noise environment, which is almost certainly greater in Washington D.C. than in southern Florida, a propagation range of 20 miles in southern Florida would be equivalent to around 3 miles in an urban area like Washington, D.C. MobileVision's use of a slightly lower power (200 W) than that used by Pinpoint would have a very small effect. Without taking these considerations into account, one plainly cannot begin to compare, as does MobileVision, effective system ranges of different systems in profoundly different propagation environments.[9]

2. *The location accuracy of the Pinpoint system is typically very good.*

MobileVision claims, without any technical support, that the Pinpoint system accuracy is substandard and that the MobileVision system accuracy is better under "real suburban" conditions. This claim is based on an artful quoting out of context of the following statement: "The points are scattered over a range of about two hundred feet *at a few* of the locations along the test route." (italics added)

The statement in our Report was an accurate estimate of the practical worst-case performance along the test route. The two-hundred-foot figure was close to the extreme spread of the data, excluding four or five of the three hundred samples. These four or five samples would likely be excluded in commercially-deployed versions of the system. In fact, about ninety-five percent of the sample points were within about thirty feet of the measurement path,[10] even though the data were not processed or corrected and were produced by a minimum

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[8] Special Issue on Mobile Radio Propagation, Section V -- Evaluation of Current Methods, *IEEE Transactions on Vehicular Technology, February, 1988.* See Figure 2 on page 26.

[9] Pinpoint has, in fact, demonstrated that, in open and flat terrain, its base station signals can be received at ranges out to the radio horizon. In testing in the Dallas area, for example, a TransModem radio reliably received signals at ranges of 16 miles.

[10] Pinpoint determed this accuracy by comparing the ARRAY™ network fixes with reference positions using differential GPS techniques estimated to be accurate within one meter.

configuration of four receive sites, as explained in the Report. The measurement points are systematically paired, and the improved calibration that one would see in a commercially-deployed system would obviously increase the consistency of the measurements and contribute to substantial accuracy improvements.

MobileVision incorrectly states that the Pinpoint test route in the Northern Virginia/District of Columbia test ran "along the sides of the Potomac" and "mainly through parks." The route map (Figure 3) in the Hatfield Report plainly shows that the route includes built-up areas as well as open and suburban-like areas.

Good propagation conditions along about half of the position measurement route were fortuitous since these locations allowed Pinpoint to demonstrate the *inherent* positioning accuracy of its system design. On the remaining half of the route, there was only an occasional line-of-sight path to one or two of the base stations. If one considers the small systematic scattering of position fixes at each location to be attributable mainly to small calibration errors, the vast majority of the position determinations were very accurate.

The readily apparent inherent positioning accuracy of the Pinpoint system is such that these errors are small in comparison with errors caused by excess propagation times (which are equivalent to excess range errors) in most environments.[11] All terrestrially-based locating systems, including those operating in the 902 - 928 MHz band, are subject to excess range positioning errors. It is also a mathematically-established fact that broad-bandwidth, spread-

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[11] See, for example, Turin, G. L., W. S. Jewell, and T. L. Johnston, "Simulation of Urban Vehicle-Monitoring Systems," *IEEE Transactions on Vehicular Technology, February, 1972.* Figure 5 of this paper shows pulse-ranging errors in different propagation environments. In dense "high-rise" areas, the mean excess range was 312 feet, the standard deviation was 214 feet, and 95 percent of the excess ranges were within 950 feet. For suburban areas primarily containing wood-frame residences, the mean excess range was 169 feet, the standard deviation was 182 feet, and 95 percent of the excess ranges were within 445 feet.

These results were for an operating frequency of 1280 MHz, but the results the simulations were based on involved measurements at 488, 1280, and 2920 MHz in which the frequency dependency of the results was extremely small, and the agreements between the simulations and actual measurements were very good. Figure 9 of Turin, et al., displays radial-location-error distributions for a pulse-ranging AVM system. For a range of conditions, mean values ranged from 139 to 200 feet, median values from 110 to 154 feet, and 95 percent of the errors fell within a range of 300 feet to 460 feet.

Comparison of the Pinpoint positioning measurement results with those presented in the paper by Turin, et al., suggests that the Pinpoint system was operating well within the bounds of what could be expected from a fundamentally well-designed positioning system.

spectrum systems, like Pinpoint's, inherently determine time delays (and therefore range) more accurately than do narrowband systems. This capability is further enhanced by the ability of wide-band spread spectrum systems to resolve closely-spaced multipath signals and thereby make use of the earliest arriving signal from each base station. The bandwidth contemplated by the Pinpoint system under final AVM rules will be at least twice that of any of the other proposed systems and thus will unquestionably lead to theoretically superior ranging performance. (MobileVision recognizes this fact and observes that "the fragmentation of the frequency band reduces significantly the ability of the LMS system to resolve multipath signals and ensure reliability of location functions." Further Comments of MobileVision, L.P., at 25.) This minimizes positioning errors resulting from excess path delays, which are the primary contributors to range errors. Positioning accuracy of a well-designed system, such as Pinpoint's, is limited by these well-documented excess range errors and not by the inherent accuracy of the system design.

3. *The Pinpoint system can manage any potential interference from local-area AVM systems.*

MobileVision claims that the Pinpoint system is more susceptible to interference than are competing systems. MobileVision's principal error in making this claim is in equating the mere detection of the presence of another system's signal with destructive interference caused by the other system. The Hatfield Report noted that the TransModem radio would not receive polls when it was within fifty to one hundred feet of the Amtech transmitter. The Report concluded that this local interference was of no more concern than the coverage "holes" and deep multipath fades that unavoidably exist in any wireless network, because the system will attempt multiple transmissions. Also, the Amtech and the Pinpoint systems do not operate with 100% duty cycles: Even when the TransModem radio is very close to an Amtech transmitter, the likelihood of interference is modified by the probability that the Amtech system transmits during the time that the ARRAY™ network transmits a message to the TransModem radio.

It is useful to quote the entire context of the original Hatfield Report: "When the Pinpoint mobile was within about five hundred feet of the Amtech reader and the Amtech system was transmitting (the Amtech reader transmits only when vehicles are present), the Amtech equipment again occasionally detected the Pinpoint signals, and vice versa. When the Pinpoint vehicle was within fifty to about one hundred feet of the Amtech reader, it did not receive signals from the base station and hence would not respond to polls. Pinpoint concluded that this is not harmful to its overall operation, because the area in which the base station transmission could not be received is quite small, and the system could track the mobile into the area of interference and mark its position until it moved away from the interfering transmitter. At these distances, 50 to 100 feet, Amtech again found that its system operations were not affected." MobileVision has once again distorted and misquoted the statement in the original report.

The equipment configuration used in the joint Pinpoint/Amtech compatibility tests established worst-case conditions: the transmitted power level used by Amtech is the highest it would use in a commercial system, because higher levels would increase the "clutter" resulting from illuminating too many tags (in adjacent lanes, for example) at once. In many applications, Amtech will require considerably less transmitted power, perhaps as much as an order of magnitude (10 dB) less, than that used in these tests. Also, Amtech tilts its fixed antennas downward in commercial installations as a matter of practical antenna placement in relation to the tags to be illuminated so as to increase lane discrimination and confine the reading zone. This tilting also has the effect of reducing the range at which the Amtech transmitter interferes with TransModem radios in real-world operations.

HATFIELD ASSOCIATES, INC.
International Telecommunications Consultants

Declaration of Richard A. Chandler

I, Richard A. Chandler, declare, under penalty of perjury, the following:

1. I am a senior vice president of Hatfield Associates, Inc.;

2. The attached statement was prepared under my direction by Hatfield Associates, Inc., on behalf of Pinpoint Communications, Inc.;

3. The statements therein are true and correct to the best of my best of my knowledge.

Richard Chandler

March 28, 1994

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EXHIBIT 2

A Response to MobileVision's Annex 3: Time-Sharing Considerations

by

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of
Pinpoint Communications, Inc.

INTRODUCTION

MobileVision's Further Comments include an Annex 3, entitled "Time Sharing Considerations for Wideband LMS Systems." In this Annex, MobileVision asserts, on various grounds, that there is no basis on which wide-area automatic vehicle monitoring (AVM) systems may time share the AVM band, i.e. 902-928 MHz. MobileVision makes numerous facile "arguments" replete with questions, the answers to which MobileVision would have found had it reviewed Pinpoint's earlier submissions in the FCC's rulemaking docket. Much of MobileVision's discussion rests on subordinating the radiolocation functions of AVM to its own desire for uninterrupted access to spectrum to support voice and narrowband data functions. Such an approach confuses the consideration of time sharing because pulse-ranging hyperbolic multilateration, unlike voice, is inherently subject to time sharing due to its use of pulses of short duration to perform location functions. Generally, the shorter the duration, the greater the radiolocation capacity of the system.

The 902-928 MHz band, in Pinpoint's view, is uniquely suited to high capacity AVM. It should not be dedicated to the operation of narrow-band voice and data links, as contemplated by MobileVision. These functions can be accommodated in other spectrum allocated for such purposes and, if MobileVision likes, linked with an AVM system in the 902-928 MHz band.

MobileVision also asserts that any requirement to time share will fatally delay the introduction of its service. From declarations in the body of Annex 3, this concern appears motivated by MobileVision's assessment that it must acquire essentially monopolistic access to at least 8 MHz of spectrum, in all of its currently licensed locations, to make its service economically viable. MobileVision's asserts that any further delay by the Commission in issuing an Order making it possible for MobileVision to deploy a voice and data SMR-type services with incidental radiolocating capability in the 902-928 MHz band will seriously impact its ability to survive. The information from other interested parties in this proceeding suggests this need not be true.

In its Further Comments, MobileVision contends that its LMS service will provide, in effect, "all things to all people." MobileVision's market and financial analysis/projections to this effect fall prey to all the "over-generalized projection" pitfalls that Teletrac made earlier in the Comments, and which Pinpoint discussed at length in its Reply Comments[1]. Other systems, such as Pinpoint and Southwestern Bell, are confident of viability while concentrating on radiolocation, the *raison d'etre* of the AVM service.

THE PINPOINT TIME SHARING APPROACH IS FLEXIBLE

The fact that MobileVision purports to regard the difficulty of designing and implementing a time-sharable system as daunting does not mean that competent engineering cannot economically implement such systems. Contrary to the assertions in Annex 3, it is not generally agreed that two or more independent spread spectrum location systems cannot co-exist in the same frequency band. Teletrac's proposal for allowing the mobile-to-base location pulses of different

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[1] "Analysis of the Economics of Channel Exclusivity for Wide-Area Location Monitoring Systems" by W. Wayne Stargardt attached to Pinpoint's July 29, 1993 Reply Comments in Docket 93-61.

location systems to use the same spectrum on an uncoordinated basis, is already supported by field tests by Teletrac and a great deal of theoretical and field work done by Hughes and Qualcomm.[2] While such an uncoordinated approach would not be the most efficient way to share the limited AVM spectrum, it does illustrate the fundamental feasibility of one form of sharing.

Moreover, no one has ever proposed that access to the band be on a formal TDMA basis, as MobileVision asserts. Pinpoint has advocated access on a time-shared basis, which is potentially much simpler than any formal, "text-book" TDMA scheme, and can thereby accommodate a variety of AVM systems, a point which MobileVision conveniently overlooks. Pinpoint suggested further that, if financially and technically qualified AVM systems applying in a given market fail to reach an agreement on any one of a number of more efficient time-sharing mechanisms,[3] the FCC should require that they fall back to access on a simple, round robin, time-sliced basis.

MobileVision fails to appreciate the flexible approach advocated by Pinpoint. For example, pursuant to negotiated sharing arrangements, time slots need not be of equal duration.[4] As a result, it is simply incorrect, as MobileVision asserts, that "there will be dead periods equal to the duration of a location burst, at the end of each time slice that cannot be used." If a system is unable to use 55 ms or more of their time slot, as MobileVision suggests it will be unable to use, that system's time slice should be shortened and made available to more efficient systems able

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[2] Such sharing appears predicated on reasonable power limits on all mobile units (to ensure that the near-far problem is contained within manageable bounds of dynamic range).

[3] MobileVision asks how many systems should (M) be permitted in the market. Pinpoint's consistent response, in keeping with the FCC's longstanding policies, is that this is a question to be determined by the marketplace.

[4] Moreover, the number of time slices in a market does not have to equal the number of systems, as more than one system may operate in a given timeslot through frequency division, CDMA, or spatial diversity, or a combination of these.

to use the time. Pinpoint, for example, could transmit approximately 50 position fixes and 50 data messages in 55 ms.[5] This realignment of time slice boundaries could be achieved by market forces.

MobileVision's discourse on "the problems of specifying time division" would make complex what Pinpoint has previously explained to be a fundamentally uncomplicated situation. At the simplest level, i.e., round-robin time-slicing, once the timing standard and order of access have been agreed upon, is very easy to implement and manage. However, it is also the crudest mechanism for implementing a time-sharing scheme. For example, there are much more efficient mechanisms, as Pinpoint has explained in response to affidavits by Dr. Charles Jackson prepared on PacTel Teletrac's behalf. Granted, these methods do require somewhat more coordination between users, but they are capable of very significantly reductions in airtime wasted by assigning fixed time access slots to each system, since airtime unused at a particular time by a particular system is not available to another system that has use for that airtime. The Pinpoint system, in fact, uses such a mechanism internally to manage the access of multiple vehicles, by scheduling use of airtime on both a "time and place" (when and where) basis. If the market can support these mechanisms, they could be implemented to take time sharing beyond a round-robin basis.[6]

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[5] MobileVision's suggestion that the duration of a location burst for PacTel Teletrac is on the order of 100 ms and for Southwestern Bell up to 1 second is flatly contrary to the claims of these parties, which have suggested capacities of twenty position fixes a second (Southwestern Bell) to several times that many (PacTel Teletrac).

[6] MobileVision suggests that there will be a compatibility problem for one entity's AVM systems in adjacent markets if the time-sharing arrangement in one market is not the same in the next. That MobileVision believes this may cause a problem indicates its failure to understand that the use of a time slot in any market is a software function and not part of the "hard-wiring" of the system architecture in a given market. In short, when a mobile goes from one city to the next, the timing and control stations will inform the mobile of the new time slots in which it is permitted to be "on-the-air."

WASTED TIME

MobileVision also suggests that much time will be wasted in a time-sharing arrangement because of the need for "large amounts of guard time." MobileVision's argument seems to imply that modern electronic equipment is still using water clocks to keep time. MobileVision has correctly pointed out elsewhere in its comments that any mobile equipment working on a vehicle location system is being managed by micro-processor based controllers, which are typically capable themselves of resolving real time events to within one ten-thousandth of a second (10 microseconds) or less.

MobileVision states that the accuracy of the timing will only be 10 milliseconds if the dedicated control channel constantly updates the mobile's time. Assuming that the communication range between a mobile and the furthest base station was as much as 20 miles implies a propagation delay uncertainty, which is the main source of timing uncertainty, of only 100 microseconds. That is only 1/10 of a millisecond, or about 1% of the 10 milliseconds claimed in the MobileVision Annex.

It is interesting to note that MobileVision states elsewhere in its comments (Annex 5) that its system's standard cell size has an 8-mile radius. If that is the case, the propagation delay uncertainty would be reduced by about 40%, to under 1/20th of a millisecond. At most, with a propagation path of 20 miles and the differential in accounting the timing signal's propagation (e.g., GPS) over a metropolitan area, guardbands need only be on the order of 300 microseconds, as Pinpoint explained in its earlier comments on the ex partes of PacTel and Southwestern Bell.

VOICE AND DATA OPERATIONS

MobileVision's consideration of loss of data throughput as a result of time sharing is a red herring. The data rates used in MobileVision's example suggest that the data would be transmitted over a time-shared narrowband data channel, not a time-shared wideband vehicle location channel on the same signal as location pulses. As outlined in Pinpoint's proposed band plan, narrowband control/data channels generally would not be shared. Further, voice/data channels incapable of time sharing should be implemented outside the 902-928 MHz AVM band, except on a limited emergency basis.

Pinpoint will not debate the validity or appropriateness of MobileVision's market research regarding MobileVision's perceived needs for voice and data services in combination with its AVM services. In short, if MobileVision perceives that its location services must be bundled with narrowband, dedicated channels, then MobileVision should obtain the latter from an allocation for some other service, such as SMR, cellular telephone, or any of the other land mobile services. The ability to use the 902-928 MHz band, which is uniquely suitable for high capacity radio location and data operations, should not be compromised.

RELIABILITY

MobileVision states that time sharing would totally compromise the reliability and integrity of all systems. MobileVision poses the scenario of mobile or a base station transmitting in other systems' timeslots. Essentially, MobileVision's discussion reduces to a suggestion that engineers and designers are incapable of finding solutions for the problems of "mistransmission". However, it is almost a trivial issue to prevent lengthy misstransmission by any particular mobile radio by placing a "fuse-equivalent" function in the power path of the transmit section of a

mobile to prevent it from continuous "key down" transmission. Mobiles found to be "unreliable" can be shut down by the network. Additional solutions can be found, in much the same way that solutions have been found for ever decreasing spacing between voice channels. Pinpoint has already implemented such measures to ensure the reliability of its own time-sharing, frequency reuse network's operation.

DELAY VERSUS ARBITRARY "STANDARD SYSTEM"

MobileVision suggests that there is no common ground for a set of time-sharing rules. This contention indicates that MobileVision may have some ulterior motive in mind, such as spectrum windfall. There is much "common ground," including: (1) the inherent short duration of vehicular pulses in any radiolocation system; (2) the flexiblity and "intelligence" inherent in software controlled, microprocessor managed radios used for radiolocation in all modern AVM systems; (3) the precise timing capability of both the mobile and base station ends of the links; and (4) the availability of only one single, very limited, multiple use, shared band (902-928 MHz) with sufficient bandwidth for high-capacity AVM.

If the process of coming to agreement on how to use this band requires the delays outlined by MobileVision, then such delays are preferable to the alternative of the FCC mandating the acceptance of low capacity, interference-intolerant AVM systems as the *de facto* AVM systems of the future.