require dedicated common lines among the system operators.

15. Access to the spectrum in a TDMA sharing arrangement can be accomplished in a number of different ways. For example, a crude but simple system (originally called "time-slicing" in the early days of mainframe sharing) would be for each system to have access to the air for the same period of time on a periodic basis, the amount and the period to be determined by the number of participants and the tolerable response latencies of the systems. In other words, access would be identical for each market participant on a "round robin" basis. For example, if there were four systems, each one might have one-quarter second access every second. Each system clock would be synchronized to a common standard to avoid interference or the need for any type of "carrier detect" before transmissions begin. Dedicated lines between systems or to a centralized location would not be a necessity in this arrangement. However, the cost of this simple approach is that it is potentially very wasteful of "airtime", i.e. it is spectrally inefficient to the extent that all operators may not need the entire interval assigned to them each time that it arises.

16. One solution to make this basic TDMA system more spectrally efficient is to allow system operators to agree among themselves, on a bilateral or multilateral basis, to share information, via the system computers, about their use of their time slots and to permit another system to use any unused time slots or portions thereof -- on a real-time or anticipated basis.

Over agreed upon periods, say once a month, systems would settle accounts among themselves for the time that they "sold" or "loaned/borrowed" to other licensees.

17. A more sophisticated solution to this problem of inefficient use would be for a centralized "arbitrator" to schedule time in advance based upon operator requests. In such a system, each operator would be interconnected with the arbitrator, albeit not necessarily with each other. Each system would still have "free" access to the spectrum a specific proportion of the time depending upon the number of market participants, but could obtain additional time to the extent it has a requirement for time and other operators were unable to use their entire time allotment. Such an "arbitrator" could be made "intelligent" enough to respond to both the place where, and time for when, the request was being made. This would allow the systems that could make use of this time/place facility to benefit from channel reuse across different user systems, much like SMR does across channels but in time and area dimensions rather than the frequency dimension.

18. None of these systems require rule changes to implement. In a shared spectrum environment, the market is likely to lead to something similar to one of these variations.

19. The key to any of these sharing scenarios is a common clock synchronization standard. Because synchronization would be maintained on the basis of an independent standard, Dr. Jackson's observation in paragraph 18 that "[i]f one system's requirement for

a minimum contiguous block of time exceeds another system's maximum time without transmissions, then the systems could not share a band segment" is not supportable. This statement is "true" only if the second system needs to be on the air -- through some sort of forward link -- almost continuously to maintain synchronization. However, such a requirement betrays a significant inefficiency on the part of the second system that should not be turned into a justification for exclusivity.

20. Pinpoint's review of the materials that PacTel has submitted to the Commission in support of its Petition for Rulemaking suggest that PacTel's system may be this inefficient. If so, then Pinpoint submits that the PacTel system should be modified so as to make sharing a possibility, as contemplated by the licensing scheme under which PacTel's authorizations were granted. In any event, Dr. Jackson's conclusions against sharing are incorrect for soundly engineered systems that do not have to transmit continuously and would be able to maintain synchronization through an independent standard.

21. The second purportedly insurmountable problem is discussed in Paragraph 19 of the Jackson Affidavit, which states that TDMA "does not appear to accommodate asynchronous transmission from mobile units." This statement is correct, but again is irrelevant. Literal or technically pure asynchronous operation is not in anyway a desired feature of any AVM system, nor are the public interest benefits to which Dr. Jackson refers unique to such

operation. Under a TDMA system, users will still perceive transmissions as "real time" (as in asynchronous operations) whether waiting intervals are 5 milliseconds or half a second or two seconds. Such a delay need not impair PacTel's "panic button" operation, for example.

22. From a system standpoint, asynchronous operations are monumentally inefficient. The history of citizen's band radio in this country provides an example of what any true asynchronous radio operations will suffer in terms of capacity. AVM should not be allowed to undergo a similar fate or the prospect of intelligent vehicle highway systems will never be realized. Dr. Jackson's comments on "efficiency" in footnotes 1 & 6 of his affidavit describe a cost-benefit tradeoff rather than efficiency of spectrum utilization. Dr. Jackson loses sight of who is paying for the apparent cost advantage of the simplified pure Aloha approach, namely all the other users of the limited spectrum. As to system security, Dr. Jackson's contention is true in a lightly loaded system, but in situations involving heavily loaded high-capacity HML AVM systems, asynchronous operations confer no such advantage. Regarding reliability in asynchronous mode, Dr. Jackson's statement is true only for simple inexpensive equipment but synchronous mode is certainly preferable for reliable communications because it can be structured to avoid unnecessary collisions among signals. With modern microprocessor controlled radio data equipment, however, the cost of implementing synchronous vs. asynchronous operation lies

mainly in programming and should not deter efficient operation.

23. Dr. Jackson's third and fourth arguments against TDMA are summed up as follows: "[m]aintaining system synchronization and transmitting other overhead communications becomes difficult and wastes spectrum in a time-division scenario." Jackson Affidavit ¶

24. These two assumptions are equally flawed. Maintaining synchronization is not difficult nor does it waste spectrum. What is required in an efficient TDMA scheme is that base stations and mobile transceivers periodically listen to a signal that contains synchronization information that is locked to a common standard agreed upon by all sharers beforehand, and maintain synchronization internally in the intervals between listening. How long that interval is will depend upon the sophistication of the mobile unit, but it need not be wasteful of spectrum, since all systems will be tuned to signals locked to the same standard.

25. Concomitantly, there should be no need among systems synchronized to a common standard to crowd the spectrum with overhead transmissions as the Jackson Affidavit postulates in paragraph 20. Dr. Jackson's example is simplistic and his choice of "arbitrary numbers" misleading. On the one hand, the Jackson Affidavit assumes that each unit must resynchronize prior to transmissions. On the other hand, it assumes that each system is synchronized independently in time, such that each entrant will have to use, say, 25 percent of the total capacity in the band to maintain synchronization. Using Dr. Jackson's admittedly

"arbitrary numbers" for a moment, the "overhead" requirement for all systems taken as whole is likely to remain in the vicinity of 25 percent of the total capacity of the entire band as additional participants enter, and not approach 100 percent as the number of entrants reaches four. Furthermore, systems utilizing such a large proportion of their available resources (airtime) on synchronization as Dr. Jackson suggests are obviously candidates for design reevaluation and change. If his numbers more accurately described operations of real systems, (i.e., overhead transmissions for time synchronization are much less than 1% of total capacity), then, even if each system's overhead were a constant proportion of the available time, his argument would fail on practical grounds.

26. Pinpoint does not mean to suggest by taking a position contrary to Dr. Jackson that the implementation of TDMA sharing for wideband HML AVM systems will be absolutely free of practical difficulties. However, sharing is possible and, with cooperation among entrants, can be practical. The rulemaking in which the Commission currently is engaged is an ideal opportunity for the agency to adopt rules to better accommodate such sharing. In the absence of such rule changes, as the Commission has noted, sharing the spectrum is already the regulatory structure in the 900 MHz AVM sub-bands. Moreover, the obligation of licensees in the band under the FCC's Rules is to cooperate in achieving a successful sharing arrangement. In short, it is with the following understanding that Pinpoint has made its proposals and filed its applications:

sharing among wideband HML AVM systems is possible and practical.

Louis H.M. Jandrell

Subscribed to and sworn before
me this 4th day of June, 1993

Barbara A. Sitrak
Notary Public

My commission expires: 8-14-93

CERTIFICATE OF SERVICE

I hereby certify that on this 4th day of June, 1993, I caused copies of the

Alfred W. Whittaker
Mitchell F. Hertz
James W. Draughn, Jr.
Kirkland & Ellis
655 15th Street, N.W.
Washington, D.C. 20009

Richard C. Steinmetz
1201 S. 2nd Street
Milwaukee, WI 53204

George Y. Wheeler
Koteen & Naftalin
1150 Connecticut Ave., N.W.
Suite 1000
Washington, D.C. 20036

David M. Evan
Consolidated Rail Corp.
6 Penn Center Plaza
Philadelphia, PA 19103-2959

Ken Siegel
American Trucking Assoc.
2200 Mill Road
Alexandria, VA 22314

C.A. Moore
City of Los Angeles
Department of Airports
P.O. Box 92216
Los Angeles, CA 90009

Richard L. Ridings
Oklahoma Turnpike Authority
3500 Martin Luther King Ave.
P.O. Box 11357
Oklahoma City, OK 73136

David L. Hill
Audrey P. Rasmussen
O'Conner & Hannan
1919 Pennsylvania Ave., N.W.
Suite 800
Washington, D.C. 20006

Hunter O. Wagner, Jr.
Greater New Orleans Expressway
Commission
P.O. Box 7656
Metairie, LA 70010

Richard F. Andino
Amtech Logistics Corp.
17304 Preston Road, E100
Dallas, TX 75252

James S. Marston
American President Co., Ltd
1111 Broadway
Oakland, CA 94607

Thomas J. Keller
Verner, Liipfert, Bernhard,
McPherson & Hand
901 15th Street, N.W.
Suite 700
Washington, D.C. 20005

Bethany G. Smith

Bethany G. Smith

* Hand-Delivered