LAND MOBILE, SUCCESSES AND FAILURES IN THE 1970'S

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I am pleased to speak again before the Vehicular Technology Society of the IEEE. The last paper I delivered to this group was entitled "The Design, Installation and Maintenance of a 1000 Unit Mobile Radio System." Even compared to the highly sophisticated, multichannel, computer controlled emergency systems of today, that is still a fairly interesting project. What bothers me is that I gave that paper at our Houston conference in October, 1954 - over 25 years ago - and only this year, was I invited back.

I do not want to wait another 25 years after this one so I dug out and reread the old paper to see if I could avoid whatever mistakes I made then. It was interesting. In the early 50's we were having problems of channel congestion, interference, availability of antenna sites and shortage of skilled technicians. Does this sound familiar?

In spite of those 1954 problems, the industry has put in service, and is operating with reasonable success, more than 5 million additional land mobile transmitters, most of them in the same frequency space we had in 1954. Of course, the congestion is very much worse, and the effectiveness of many systems has been severely reduced but they are still saving this country millions of gallons of gasoline. I was sorely tempted to bring copies to distribute to those in the new generation of communicators who somehow feel that today's problems are unique and that FCC and industry have done such a poor job of spectrum management we now need radical changes.

However, I did not come here today to give you a 1954 speech, or to say that we should not be innovative in our thinking. Instead, it is my hope that I can focus on some areas where I feel that we, as the engineers most directly concerned with mobile radio, have succeeded during the past decade, where we have failed and need for further successes in the 1980's.

In so doing, I do not intend to pose as an "elder statesman" just because after 34 years in mobile radio I have some gray hair and am over 1000 miles from home. I will say, however, that over the years, a person's memory usually gains in frankness what it loses in precision. But this group should have no problem in handling frankness about our own profession.

Unquestionably, the greatest LM success story of the 1970's is the remarkable way that land mobile engineers have so rapidly incorporated solid state advances into the design of mobile radio equipment and pagers. It was not very many years ago that many of us were excited by the prospects of using transistors just in the audio and intermediate frequency portions of our equipment. The idea of an all solid state unit with excellent intermodulation characteristics and significant power output at 450 MHz, much less 800 MHz, seemed an almost impossible dream.

I recall that in 1970 when AT&T was talking about a thousand dollar 800 MHz mobile telephone some of us felt this was just a ploy to help them lock up the 75 MHz then allocated exclusively to them for cellular systems. That may have been part of it, but when we now see microprocessor controlled 800 channel amateur equipment with scanning, memory and 25 watts at 144 MHz selling for less than $500, a somewhat more sophisticated unit at 800 MHz for $1,000 doesn't sound too far off.

Paging, has particularly benefitted from solid state technology. It has developed into a remarkably efficient means of meeting the communications requirements of a large portion of the American public. Today it is not uncommon for a single RF channel to provide efficient low cost signalling or "beeper" service to 30 or 40 thousand individuals in a single metropolitan area. Another channel can provide brief voice messages for as many as 1500 individuals in a single area.

All of this has been made possible by automatic terminals using solid state storage, both for tones and voice, to feed signals at constant rate into the channel - utilizing 100% of the air time. With such efficiencies, it is not surprising that the proposal to authorize additional tone and voice paging channels at 800 MHz had no opposition. This is probably one of the few FCC proposals in recent years that had unanimous support!

Another engineering success for land mobile in the 1970's has been control of interference. The potential for interference increases exponentially as the number of transmitters that go in service. As a result, the millions of transmitters put in service in the last decade have created tremendous interference problems, particularly in major metropolitan areas. It is still very bad but, had it not been for the development of better receiver front ends, cavities, and other techniques, many of our channels would be unusable. I mentioned earlier that in 1954, we had problems finding transmitter sites. We still have problems, but through the use of transmitter combiners we are able to put eight or more systems on a single antenna and still control interference. As antenna space continues to command a premium, these benefits will become even more important.

One area where we have succeeded, but only just barely, is in maintenance. I mentioned a moment ago that in 1954 one of our problems was shortage of technicians. Solid state developments have done away with most vacuum tubes, substantially increasing the mean time between failures. Nevertheless, the greater sophistication and the crowded spectrum still requires high technical skills to keep equipment operating at top performance. The problem is compounded by the fierce competition for skilled electronic technicians.

We still have young men and women coming out of high school or the armed forces who are as eager to work in electronics as they were 25 years ago, but today their options are now much greater. Can you really blame them for preferring work on word processing equipment, PABX, or CRT terminals in an air-conditioned office instead of installing a radio in a concrete mixing truck or on some snow-swept mountain top?

Fortunately, in the past decade the industry has developed some excellent test equipment including frequency and modulation monitors, noise analyzers, etc. These have multiplied the effectiveness of our technicians, but as the industry continues to grow in size and complexity and the competition for technicians increases, we need to do even better. Vibration proof connectors have so improved that we should transfer more modular and plug-in technology from base stations to mobile equipment. Additional diagnostic test jigs for specific pieces of equipment will also help.

Land mobile is one of the few industries that has had success in the fight against inflation. The advancements in solid state technology have not only improved the reliability and versatility of land mobile equipment, it has enabled manufacturers to hold down, or reduce, costs of equipment. In 1970, a high quality single channel mobile unit cost about $800 or approximately 20 percent of the $4,000 car in which it was installed. Today, the same unit with even better performance still costs $800 or 10% of the car which is now $8,000.

Even more dramatic is the paging receiver. Ten years ago a "beeper" was $300. Today's smaller and lighter counterpart has twice the battery life and costs $150.

Despite the need to make substantial investments in terminals and sharp increases in interest, labor and operating costs, Radio Common Carriers are probably the only utilities in the nation that have not petitioned their Public Service Commissions for rate increases. This means that in real dollars, car telephone and paging service is less costly than it was ten years ago.

As a direct result of these successes our industry has made available - to the public safety and industrial operations of this country - economical, reliable, mobile communications on a vast scale, saving millions of gallons of gasoline, reducing pollution and improving productivity.

Don't take my word for it. A Department of Commerce pamphlet issued in 1974, entitled "Conserving Energy through the Use of Mobile Radio" estimated that three radio equipped vehicles could do the work of five vehicles not so equipped and stated that this country could save a billion gallons of gasoline annually through the expanded use of mobile radio.

While we can take pride in helping our country conserve energy, we could have done even more. That is, in my view, the industry's major failure of the 1970's.

After years of hearings, hundreds of filings and hours of oral arguments, the FCC, in 1974, allocated to land mobile 115 MHz of new spectrum. This is almost three times the 42MHz allocated in 1949 and on which millions of transmitters have been operating. Even though six years have passed, only a small portion of that new allocation has been implemented and even that small part is now in dispute.

I recognize that a major part of the delay in implementation has been, and probably will continue to be, the litigation by parties who have strong equity positions in various aspects of these proceedings. However, I believe that we engineers, in our zeal to maximize spectrum efficiency and to achieve the ultimate in frequency utilization, have compounded the problem.

Today the common carriers, both RCC's and telephone companies, have thousands of people on waiting lists for car telephone service. Waiting lists do not save gasoline. Is it really in the national interest for us to cause gasoline to be wasted over several years just so we might achieve the engineer's dream of not wasting a single drop of the new spectrum?

Unlike other natural resources, the radio spectrum is not depleted by use. If we do not have maximum efficiency when we start using it, we can always make improvements. Something like this occurred when the land mobile service was first started on lower frequency bands. For example, when the 450 MHz band was opened, we operated with 100 KHz spacing and implementation was not slowed by the then high cost of precision oscillators and receiver selectivity. However, as the band began to fill, the channels were first split to 50 and then to 25 KHz. Had we insisted on 25 KHz from the beginning instead of an incremental approach, several years would have been lost in the utilization of those frequencies.

Apparently, the FCC is having some second thoughts about the near term need, or achieveability, of its original goals for spectrum utilization in the face of other more pressing national interests. In its most recent notice of proposed rule-making and inquiry in Docket 18262, the Commission has specifically requested comments on this issue. Hopefully, we engineers can come up with an incremental form of 800 MHz mobile telephone service that would be nationwide compatible but at the same time not require charging the general public for spectrum efficiency that will not be needed in many markets for 8-10 years.

Although the FCC's latest action reopened many old issues that in themselves, could create additional litigation delays, I am encouraged that the entire tone of the FCC order indicates a desire to move forward promptly. If they are successful, they will certainly have the support, not only of land mobile users but the President of the United States.

Among his proposals to reduce inflation and conserve energies the President, in a letter to Congress on October 31, 1979, announced an Industrial Innovation Program with a goal of improving energy conservation, and productivity through increased use of technology. In that portion of the President's message dealing with the Federal regulatory system he specifically mentioned the need "to eliminate needless rule making delays."

My concern is that in its eagerness to "do something" the Commission, or more likely the Congress, will make such broad and sweeping changes that little or no progress may be made for years. As many of us have unhappily learned over the years, the first test of any radical change from established procedures is almost always in the courts with "on the air" tests delayed for years.

Two ideas that have recently been revived are the auction and the lottery. The auction has appeal on the theory that those who need radios the most should pay the most. Historically, the FCC has endeavored to insure that our limited frequency spectrum is available on an equitable basis to all citizens. Under an auction, it is conceivable that organizations with large economic resources could tie up blocks of spectrum or a large number of channels solely as a result of their economic muscle instead of a genuine need for the use of radio in the public interest.

A more recent suggestion is to have a lottery for channels instead of a comparative hearing. In my view, the efficient utilization of a valuable resource like our spectrum is far too important to be left to pure chance. This is particularly true in the development of an integrated nation wide mobile telephone service. Can you imagine what sort of telephone service we would have today if the various cities had held a lottery to determine who wired their particular areas?

The auction and lottery proposals have arisen because of the frustration all of us have felt from delays and expense of comparative hearings. However, for the most part, these have occurred in broadcast and common carrier services. Services using radio as "tool" in their own business, whether it be protecting lives, drilling for oil or delivering diapers, have usually been able to obtain necessary frequency resources without too much delay. This is because industry and the Commission have, over the years, worked together to provide frequency coordination, geographical sharing and good technical standards. This joint spectrum management effort has worked so successfully that I am dismayed to discern what appears to be a trend towards an adversary relationship between FCC and industry.

Perhaps the most recent example of joint effort was the recent World Administrative Radio Conference in Geneva. Despite adverse political odds, this country and, more specifically, the land mobile industry, came out of WARC '79 in good shape. This occurred only because, over five years ago, the FCC staff began working with industry groups to prepare for this most important job. It has been said by some impartial observers that the U.S. delegation to Geneva was one of the most thoroughly prepared of any representatives to an international conference in several years. I take this opportunity to offer my congratulations to the FCC staff and other members of the delegation for a job well done.

I would again reiterate that I am in favor of examining innovative approaches to spectrum management. Let us be sure, however, that in our enthusiasm we do not discard, or compromise, the basic approaches that have been successful in the past. Today's need for expanded use of mobile radio is so acute that we simply cannot afford too much experimentation.

In 1974 when gasoline was 60¢ a gallon, Motorola ran a great ad saying that "if two-way radio was a bargain when gasoline was 35¢ a gallon, think what is must be now." I am sure that Motorola and the Department of Commerce won't mind if I close with a paraphrase. If mobile radio was important to this country's conservation efforts in 1974, think what it must be now.

Thank you.

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BIOGRAPHICAL SKETCH

JERRY S. STOVER

Jerry S. Stover, a native of Dallas, received his B.S.E.E. degree from Southern Methodist University. Following service in World War II, during which he was awarded the Bronze Star Medal for establishing communications on Omaha Beach the second day of the invasion, Stover and Tom McMullin founded Communications Industries, Inc. in 1946. The company, now publicly owned with annual sales of over $36 million, operates one of the largest RCC networks in the nation, and through two manufacturing subsidiaries, Decibel Products and Secode Electronics, manufactures antennas and other peripheral equipment for land mobile systems. Stover retired as Chairman of the Board at the beginning of this year.

Stover has been active in mobile radio for many years. In 1950, he and McMullin underwrote the formation of the Special Industrial Radio Service Association (SIRSA). Stover also served as a member of AdComm-VTS, a Director and Officer of the RCC Trade Association and has participated in numerous FCC proceedings. He is a past Director of the American Electronics Association and is currently Chairman of the Dallas/Fort Worth chapter of the Vehicular Technology Society of IEEE.

Upon his retirement from Communications Industries, Jerry Stover was appointed Special Assistant to the Dean of SMU's School of Engineering and Applied Science. He also serves as a Director of CI and other outside companies.

Stover is a member of IEEE, a Fellow of the Radio Club of America, a Director of the SMU Foundation for Science and Engineering, and a Registered Professional Engineer. A licensed amateur since the age of 13, he holds amateur extra class license W5AE.