



IEEE

VEHICULAR TECHNOLOGY SOCIETY

NEWSLETTER

Editor: A. Kent Johnson

Vol. 27, No. 4, November 1980 (ISSN 0161-7877)



CONVERGENCE 80

◆ 30th Annual IEEE VTS Conference

INTERNATIONAL CONFERENCE
ON
TRANSPORTATION ELECTRONICS

SEPTEMBER 15-17, 1980

Hyatt Regency Dearborn
and
Ford Motor Company Proving Ground
Dearborn, Michigan



President's Message

Roger D. Madden
President
IEEE Vehicular Technology Society

I have two thoughts I want to write about for this issue. Both fall under the general topic of member services.

Most members of this professional society join to receive the publications. Conferences are an important source of papers for "IEEE Transactions on Vehicular Technology", and we have been fortunate to have well-attended conferences for the past few years. This year's conference was not only well-attended, the attendance was phenomenal, and the overall program was outstanding. Approximately 1400 persons attended the 30th Annual Conference in Dearborn, Michigan in September, and approximately 120 papers were presented. The conference, entitled "Convergence '80", was chaired by Trevor O. Jones. All of us should applaud the 1980 Conference Committee for their fine job and for their donation of the many hours of work which go into the development and management of such a conference.

The second item I want to discuss is an organizational change in the structure of the VTS Board of Directors. The change is intended to strenghten our ability to respond to service needs. As you know, we are organizationally interested in mobile communications, in automotive electronics, and in transportation systems. To help meet the needs of these different interest groups, the VTS Board of Directors voted to reorganize the board along the lines of major interest. This new structure should provide maximum flexibility for growth.

The new configuration recognizes the three technical areas and sets up an Automotive Electronics Committee, a Mobile Communications Committee, and a Transportation Systems Committee. The technical committees are supported by administrative committees, and it is expected that when the reorganization plan is fully developed there will be a substantial inter-leaving between the administrative and technical committees. For example, one would expect the Associate Transactions Editor for Transportation systems to be a member of the Transportation Systems Committee and of the Publications Committee. The reorganization concept was developed by Bill Chriss, and the Reorganization Committee developing the working structure is chaired by Bob Fenton. Contact Bob if you have some helpful suggesticns or would like to assist him.

We are always looking for member participation in the affairs of the society, and we see the changes as a way to increase member participation. If you would like to participate, please let me know.

Finally, permit me to say that the past two years as president of the society have been emotionally rewarding and personally fulfilling. I hope I've helped you, the members of VTS. You certainly have helped me. Let me know if VTS should be doing something we're not doing.

Roger D. Madden
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* Inputs for newsletter staff editors should be received by newsletter editor 1 to 2 weeks before these dates.

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Editor's Notes



A. Kent Johnson
Newsletter Editor

Our annual conference held in conjunction with Convergence 80 was a huge success. It was especially gratifying to attend the Monday luncheon which honored the founders of our society (the so called Avant Garde). It was a pleasure to see them and to share their recollections of the early days of our society. Details of this luncheon and other aspects of the conference are found throughout this edition of the newsletter. Our thanks to Trevor Jones and his staff who worked so hard to provide this outstanding convergence. Thanks to Fred Sink for his contribution of some of the conference photos.



Letters

Roger D. Madden
2025 "M" Street, N.W.
Washington, DC 20554

Dear Roger,

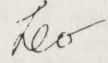
This letter is to express my personal thanks to the Vehicular Technology Society for your initiative on the "Emergency Detroit Project." Your good efforts have proved that IEEE and its Societies care for their unemployed members, and are willing and able to help them. I look forward to your continuing the good work in cooperation with USAB. It shows that when concerned IEEE members work together in harmony, especially when they can speak for both employees and/or employers, they can be a power for good.

My special thanks to V. Edgerton, VTS/PAC Chairman, for having originally set the goals of this project at the Denver PAC Workshop, and subsequently coordinated their implementation through New York, Houston, and Detroit; to H. Bowes, Program Manager, Engineering and Scientific Services, Lockheed Engineering and Management Services Co., for having committed Lockheed to the project goals, authorizing technical personnel to go to Detroit and make job offers on the spot (I understand it's the first time in Lockheed's history this method has been used); to P. Garcia, Administrative Assistant, Industrial Relations, Lockheed Engineering and Management Services Co., for getting the work out; to K. Johnson, VTS Newsletter Editor, for his excellent write-up, and to F. Lord, IMPACT Editor, for having brought this project to my personal attention.

You have set an example which I hope others will follow.

Sincerely yours,

Leo Young



Dear Mr. Madden:

Jules Verne predicted over a hundred years ago that Americans would be the first to go to the moon because they are a nation of engineers. Now, even though that prediction has come true, we are faced with a toy manufacturer who feels he can attract engineers by offering them participation in finance and marketing while downgrading the engineering function. It makes one pause to wonder what is happening.

I fully agree with you that one needs to take action against such ads to protect the profession.

It is highly encouraging to see a Society President like yourself, taking a stand for the practitioner on this matter, and I wish to thank you for it.

Sincerely,

Ronald G. Rule

Copy to
Mr. Arthur Spear
Chairman of the Board
Mattel, Inc.

5402 Yorkshire Street
Springfield, Virginia
22151

Mr. Roger D. Madden
Federal Communications Commission
2025 M Street, NW Room 5002
Washington, DC 20554

Dear Mr. Madden,

I have just finished reading your appeal in the latest issue of IMPACT, August 1980, Volume 4, Number 4. Although I agree with you in some principles, I am disturbed by what I consider a case of...overkill(?).

I think you missed several points in the Mattel ad. First, there are a number of engineers that do get stuck in positions that are somewhat routine. Mattel, in their ad, was attempting to indicate that an engineering position in their organization provides more, involving the engineer in activities that are IMPORTANT ADJUNCTS to engineering, such as follow-through from design to marketing, and understanding and working with the financial aspects and sales of his innovative results. Don't most of us, as professionals, have to do the same thing?

Further, a few changes to the ad would have given it a more positive tone. If I may suggest

SO, YOU WANT TO BE AN INNOVATIVE ENGINEER?

WELL, GET WITH IT!

...Because Mattel offers engineers the opportunity to work for the world's leading toy manufacturer, where you wind up tracking your designs and ideas from concept through marketing; involving financial aspects and sales of your innovative results. You an engineer, but something more....you're a MATTEL engineer.

If my experience means anything, the ad writers for professional talent are usually the employment personnel within the company. That's not necessarily an excuse, but a request that engineers become more involved in developing ads for engineers.

I don't believe that the Mattel ad asked for the applicant to get involved in nonengineering tasks. I hope you don't really feel that marketing, finance, and sales are nonengineering concerns! If you do, may I suggest that Industry depends on their engineers to help with those functions. In fact, the usual engineering curriculum includes courses in economics, as I remember.

Finally, a letter from some office in IEEE to Mr. Spear may have made your point adequately. Why stir up a potential tempest in a teapot?

Sincerely,

Alan O. Plait

cc: Arthur Spear

Dear Mr. Madden:

Although the Convergence 80 registration fees are minimal in relation to the travel and lodging expenses associated with attendance, member fees are too high compared to nonmember and student fees. There is little advantage in being a member.

As a VTS-IEE member my fee for pre-registration, of \$75.00, would be:

- 7.5 times the student member fee,
- 5. times the student nonmember fee,
- .88 times the nonmember, nonstudent fee.

To encourage membership, the member fee should be at least 25% less than the nonmember fee, and the student nonmember category should be eliminated. The student member fee should be 50% of the member fee.

Very truly yours,

Robert E. Herman, Jr.
0880245SM

Dear Mr. Madden:

I disagree with your understanding of the Mattel ad and your understanding of engineering. Innovation is NOT the sole province of engineering, and Mattel's hyperbole in advertisement is certainly permitted in this day and age. You waste your time, my time and the IEEE's on a cause so SMALL. What about LERA or ERA on Irish Rights in Ulster. If you've the courage, please mail this card on to Arthur Spear of Mattel.

Sincerely,

John Peter Rooney
Member 6425052

Mr. Roger Madden
FCC Room 5002
Washington, DC 20554

Re: Mattel

Dear Sir:

Engineering advances have never been easy. I cannot understand any reference to a practitioner of engineering, as "just an" engineer.

Charles Babbage once wrote "The progress of physical science is obstructed by that exhausting intellectual and mental labor indispensable for its advancement..." He was referring to the grueling hand-calculations required in his day. In 1812, while at Analytical Society quarters looking at a log table full of mistakes, he began to think in terms of building what he called an "analytical engine" capable of computing. And subsequently, he began to construct one. It would have been a mechanism of some 50,000 wheels, and gears - plus clutches, cams, axles, cranks.

However, the required engineering technology in precision machining of mechanical parts was not available. Had it been, his engine, a computer, would have worked. It was constructed, in principle, precisely as modern digital computers are designed, namely by combining the processes of logic and arithmetic. This remarkable intellectual achievement was too advanced for the mechanical engineering technology of its day, and knowledge of electrical engineering was at its infancy.

Engineering breakthroughs are still hard, and the fields of engineering deserve respect.

I've written to Mr. Spear, as you suggested, but also wish to thank you for your leadership and your responsible handling of this matter.

Cordially

V. Edgerton

cc: Mr. Arthur Spear

Dear Mr. Madden:

From my letter to Spectrum below, I believe you will see that we both perceive the same problem. Remaining an engineer is somehow stigmatized. I will fight to the last breath on this, and so will you, I suspect. Keep up the good work.

M. P. Ristenbatt

IEEE Spectrum
345 East 47th Street
New York, New York 10017

Dear Editors Jurgen, Torrero, and Rubenstein:

Please consider publishing the following "Letter to the Editor" in Spectrum at your earliest convenience. I appreciate your consideration.

A Cruel and Unproductive Fallacy

While Spectrum is to be congratulated for attempting to get engineering careers into candid and open discussion the "We Look at Ourselves: Your EE's on Their Way Up," (July 1980) is in the main an uninformed and misleading contribution.

Every productive effort in the work, and especially engineering activity, is the result of team-effort. For "every active ambitious engineer" there must be at least 5 or 6 "normally motivated" engineers to examine and carry out the details. Possibly the most pervasive fallacy that plagues U.S. technology is that "success in engineering is associated with leaving technical work (partially or totally) and moving towards management." This fallacy is not illogical: the engineer's work often directly impacts the enterprise-control, and technical knowledge is usually a requisite for rational decision-making. Also, men probably have a biologically inherited urge or tendency to control others. However, this fallacy demeans and demoralizes the vast majority of normally-motivated engineers who are a critical part of any engineering team. This in turn undermines U.S. productivity and maximizes the Peter Principle aspect. Also, it seems that organizations often intentionally promote competition for the relatively few control positions (management), as opposed to more realistically (and more productively) matching personal goals with necessary team requirements (this may also be an inherited natural tendency.)

It would appear that the article in question is attempting to perpetuate the fallacy, even though many of the rambling remarks are indeed perceptive and insightful. The selected participants were "active ambitious engineers" who are "on the move" (from knowledge positions to control positions, of course). One engineer even said: "To me, a lack of progress (towards management) is a kind of death." If this engineer wishes to be consistent, I have the following advice: when your child is about to undergo a critical operation, select the administrative head of the medical department, rather than a doctor who has done 50 similar operations in the past year; when you travel by airplane,

arrange to be piloted by the chief of operations, rather than by a regular-flying Captain who is not being promoted into management; etc.

It was noted that managers face "major frustration" in "imparting a sense of enthusiasm to subordinates." First of all, it is usually true that the (relatively ambitious) team-leader naturally gets more reward (ego and monetary) from a team-effort than do team-members. Secondly, the "subordinates" are more likely "colleagues" although the team-leader may well devote more time than do team-members. Thirdly, it will help if team-leaders are overly zealous in recognizing and propagating the contributions of the team-members.

M. P. Ristenbatt
USAB Task Force Leader

Additional Comments

My real intent is to broaden the definition of success so that it includes those who remain in technical work. My own career, and many, many inputs from practicing engineers and engineering-managers, have taught me firsthand that engineers who remain in technical work are widely considered as relatively unsuccessful. One encounters this in many places,^{1,2,3} and at least one highly-credible social-science study⁴ has pointed this out directly. If money were the sole criteria, the term "relatively unsuccessful" would indeed apply to those who remain in technical work. However, increasingly larger numbers of people, and especially those who choose engineering as their profession, include criteria in addition to money in their value system.

My thinking then is as follows: engineers will naturally continue to seek and to move into management positions, since that is where both monetary and ego rewards are maximized. This aspect does not need remedy; all the forces at work point towards this movement. The problem needing remedy is obvious if one considers: 1) the number of management positions is necessarily a minority; and 2) new blood must continuously be added to an on-going organization. If movement towards management were to be considered the only game in town for engineers, then the sheer numbers limitation would prevent a large fraction of engineers from having even a chance of achieving IEEE's goal of "opportunity for life-long contribution." In reality, the world desperately needs those engineers who either choose, or are restricted by opportunities, to remain in technical work.

I can only conclude that the widespread impression that such engineers are relatively unsuccessful must be due to the fact that heretofore engineering-professionals have not had adequate input to the definition of success in their own arena. This is plausible in light of the fact that we only started providing input in 1973.

¹The July 1980 Spectrum Projected Feature sheet said: "Knowingly we either become managers or remain employees; we either moved up the ladder or remained static."

²See the "Just an Engineer" ad that is challenged in August 1980 IMPACT.

³Prof. Farris of this University tells me this feature is evident to students, since they are

aware of the desirability of following an engineering degree with a Bus. Admin. degree.

⁴R. Perrucci, of Purdue, after an NSF-sponsored study, concluded in his book, Profession without Community that: "the additional element that must be taken into account is the belief that success is to be defined in terms of organizational advancement," p. 129.

Call for Papers

1981 IEEE Vehicular Technology Society Annual Conference

VTS 1981

Washington, D. C. April 6-8, 1981

The IEEE Vehicular Technology Society is organizing its annual conference for 1981. This will be a major technical program addressing the broad field of Vehicular Technology and will be held at the Capital Hilton in Washington, D.C.

GOAL

To examine the progress in Vehicular Electronic systems with particular emphasis on the following:

Automotive Electronics
Land Mobile Radio Systems
Mobile Telephone Applications
Personal Communications, including CB
Transportation Applications

SCOPE

Detailed topics to be covered by the conference are:

Automotive Electronics

Automotive Control Systems
Applications of New Technology
Ignition Noise Characteristics
Microprocessor - Smart Terminal Applications
Automatic Vehicle Location Systems
Automatic Vehicle Identification Systems
Electronics Systems and Device Technology
Electronic Emission Control
Electronic Techniques for Quality Control
Vehicle Guidance Systems
Reduced Fuel Consumption in re the Chip

Land Mobile Radio Systems & Mobile Telephone Applications

Spectrum Considerations
Companders and SSB Applications
Digital Signalling
Voice Privacy
Cellular Radio Systems - Mobile Telephone Applications
Trunked Radio Systems
Minimum Interference Design - Co-Channel Applications
Satellite System Applications
Frequency Hopping
New Propagation Analysis Techniques
Simulator Techniques
Long Range Mobile Communications Systems

Personal Communications

- Pocket Radio Applications
- Portable Telephones at 800 MHz
- Operator Exposure to Radio Frequency Energy
- Spread Spectrum Applications
- New Device Technology
- Microprocessor Applications
- Frequency Synthesizers
- "Packet" Technology

Transportation Applications

- New Technology - Electric Highway Systems
- Control Systems Automated Highways
- AVL and AVM Systems
- Automated Taxi Applications
- Electronic Taxi Meters
- Inductive Communication Systems
- Satellite Applications
- Traffic Control
- Motorist Information Systems including Audio Signs
- Magnetic Technology
- Propulsion & Suspension

Related Topics

- New Interconnect Applications
- Deregulation to Telephone Terminals
- Land Mobile Channel Loading Analysis as Derived from Telephone Processing Techniques
- Sensor Technology Applied to Automotive Electronics
- New Technology - Electric Hybrid Vehicles
- Fiber Optic Technology Applied to Vehicular Technology
- Automotive Entertainment Products
- New Broadcast Applications
- Noise Reduction Techniques
- AM Stereo Systems

Persons wishing to contribute to the Conference are requested to submit an abstract of not less than 500 words no later than December 15, 1980. Those authors selected by the Technical Review Committee will be invited to prepare full contributions of not more than 4000 words of text or correspondingly less if illustrations are included. (Note: Reading time of paper should be approximately 20 minutes.)

DEADLINES

The following schedule must be adhered to:

Receipt of Abstracts	December 15, 1980
Authors Selected and Notified	January 6, 1981
Papers Due in Final Form, Ready for Camera	March 6, 1981

WORKING LANGUAGE

The working language of the Conference is English and will be used for all printed material, presentations and discussions. Simultaneous interpretation will not be provided.

SUBMISSION OF CONTRIBUTIONS

Those interested in submitting papers, please forward abstracts as soon as possible, to:

Dan Davies c/o RCA Mobile Communications 1901 N. Moore Street, 7th Floor Rosslyn, Virginia 22209 (703) 558-4606	Elise M. Wright c/o E. F. Johnson Company Suite W-232 1011 Arlington Blvd. Arlington, Va. 22209 (703) 525-6286
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The detailed Conference Program and registration form will be published in Jan. 1981.

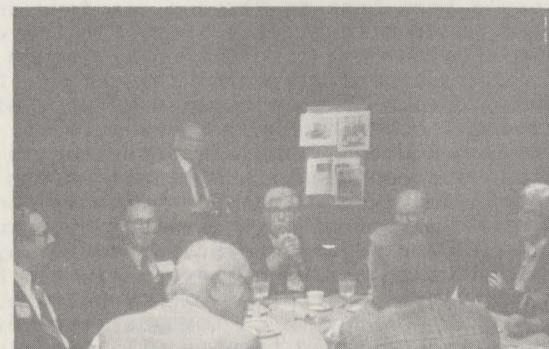
VTS

Paper of the Year Awards

This year the annual award was given to 4 authors representing both the Communications and Transportation Technology categories. The Communications Technology awardee was Paul Henry of Bell Laboratories for his excellent paper "Spectrum Efficiency of a Frequency-Hopped-DPSK Spread-Spectrum Mobile Radio System" which appeared in the November, 1979 issue. Henry's award was \$250. The Transportation Technology award was equally divided between 2 excellent papers authored by Alan Pue of John Hopkins University and David Freitage and Robert Lang of Boeing Aerospace, respectively. Pue's paper titled "Implementation Trade-Offs for a Short-Headway Vehicle-Follower Automated Transit System" appeared in the February, 1979 issue and his award was \$125. Freitage and Lang's paper titled "Programmable Digital Vehicle Control System" also appeared in the February, 1979, issue, and they split the remaining \$125 award for that category.

The awards were presented at the VTS Awards Luncheon September 15 at Convergence 80 in Dearborn, Michigan. Henry and Pue were presented their certificates and checks at the luncheon and Freitage and Lang, who were unable to attend, were represented by Mr. Clare J. Adriance, also of Boeing Aerospace.

Chuck Lynk



Upcoming Conferences of Interest

1981 VTS Annual Conference
Date: April 6, 7, 8, 1981
Location: Capital Hilton
Washington, D.C.
Contact: Stuart Meyer
E. F. Johnson Co.
1011 Arlington Blvd.
Suite W-232
Arlington, VA 22209
(703) 525-6286

International Conference on Communications
Date: June 14-17, 1981
Location: Hilton Hotel
Denver, Colorado
Contact: Robert C. Skelton
15 Inverness Way
Englewood, CO 80119
(303) 779-0600

Railroad Conference
Date: April 15-16, 1981
Location: Hyatt Regency
Atlanta, GA
Contact: Theodore S. Gordon
American Public Transit Assn.
110 17th Street, N.W.
Washington, D.C. 20036
(202) 331-1100

VTS/PAC Emergency Detroit Project: On-the-Spot Job Offers

With the Detroit unemployment rate at 14%, and some three hundred thousand United States auto industry employees out of jobs, it is of great concern to all IEEE members, but especially VTS, that any help we can give to our fellow engineers in Detroit be given immediately, effectively, and respectfully. Mr. Peter Rusche, Region IV Director, has issued a call for help to all IEEE entities.

It was in this spirit that an impromptu session at the PAC evening Workshop (Denver, September 6th) was dedicated to helping the unemployed engineers in Detroit, and was personally chaired by the USAB VP, Dr. R. Gowen. During this session, the VTS/PAC Chairman, V. Edgerton, outlined the possibility of an emergency crash program job-offer project, wherein engineers would be interviewed only by those empowered to hire them ON THE SPOT.

Given the set of IEEE members is composed of employees as well as employers-could we not use this very logical fact to help one another simply because we are capable of performing a logical act? Could we not simply be in the position that some of us need jobs and some of us have jobs and some of us (PAC's, USAB, TAB) can connect the batteries, as it were, and bring the two sources of potential together?

The challenges was posed by VTS/PAC: is there anyone in this room, who can hire anyone, on his own say so, and who can also be in Detroit Monday next (15 September)?

Three men responded positively. The plan was then developed, pending approval from VTS president, Mr. Roger Madden, that VTS might sponsor this project. Clearance would be required from IEEE and CONVERGENCE/80 management, and if all was in accordance with the rules, we would bring job offers to Detroit next week, at the same time as we'd be there for the 30th Annual VTS Conference.

This gave us exactly five working days to get the project done - and on a crash program basis, the corporations were contacted Monday, and Tuesday, 9 September of the following week for firm commitments as well as were the IEEE and CONVERGENCE management entities. By Wednesday, there was a shakedown, and only one of the three corporations remained that could keep its commitment under the rules of the game (i.e. no one would interview the engineers who was not empowered by the company to make an offer on the spot). This corporation was LOCKHEED, who later admitted it was the first time in its history (and possibly in any company's history) that it ever did this (i.e. pull technical people out and empower them to commit the company to hire, on the spot, on word alone, without the usual lengthy checking of references, etc. etc.). The man who had been in the room, in Denver, was Mr. Henry N. Bowes, Program Manager, Engineering and Scientific Services, LOCKHEED. From this moment on, the project was run by TAB entities. Mr. Madden gave LOCKHEED the local contact for Detroit, Dr. Louis Nagi, Chairman of the Detroit VT

Chapter. Ford, Chrysler, and General Motors were contacted to determine subspecialty breakouts of the laid-off engineers.

Detroit papers were contacted for a large Sunday ad, headed by the word "EMERGENCY". As there were no more rooms available at the Hyatt Regency, VTS Presidential Suite was made available as a contingency location, should LOCKHEED not be able to get proper quarters; call forwarding was arranged for the number given in the ad, to the Hyatt Regency; two engineers were selected, empowered to hire, and booked on flights to Detroit. A personnel coordinator was also appointed. Thus, the project, in response to RAB, conceived by PAC, nurtured by USAB, and implemented by TAB brought instant job offers to Detroit.

Monday the 15th, about 9:00 AM the VTS/PAC Chairman walked in to the VTS President's suite at the Hyatt Regency, Dearborne. The phone was ringing constantly, and being heavily worked by the Personnel Coordinator; two engineers, empowered to hire, were getting their work ready. The first question asked by VTS/PAC:

"Are you empowered to hire, on-the-spot?"

"Yes."

"For all jobs?"

"No - "

"Why not - that was the deal."

"Well, some of the jobs are very high salaried - we have to get those approved back in Houston - but many jobs we can hire on the spot - didn't want the ad to cut off the hirer priced jobs..."

"Well (sigh) okay - nothing's perfect."

As the Chairman started to leave, headed for the CONVERGENCE/80 lectures, one engineer walked in, was immediately greeted by a fellow-engineer (not personnel) and a technical interview started on the spot. And the Chairman was almost run down by another engineer, getting out of the elevator - heading straight for the suite.

By 6:00 PM that night, the VTS/Board meeting was over, LOCKHEED was gone for the day, had left a note - but could not be reached at their Ramada Inn quarters. The official figures had to wait till they'd been back in Houston one day, and gotten permission to release them. In his expression of gratitude to VTS/PAC, Mr. Bowes wrote: "Our successful recruiting trip to Detroit was made possible largely because of your efforts and effective coordination. There were 45 interviews conducted which have resulted in 10 offers and 3 acceptances; additional offers are expected by next week when the review is completed. Time did not permit an interview for everyone who responded to our advertisement, so yesterday 30 applications were mailed to persons in the Detroit area. We are very satisfied with results such as these. Thank you very much for your interest and efforts. Perhaps these results will encourage other companies to participate in similar recruiting efforts."

It is not true that the only laid off engineers in Detroit are automotive specialists. Layoffs were across the board, including 30% R&D in Ford, for example, covering many fields of engineering, and most importantly (to LOCKHEED) "some had been involved in work very similar to that being done on the Space Shuttle," said P. Garcia the Personnel Coordinator on the project.

There are diverse, competent, steady-job-history

engineers in Detroit, who know the layoffs will probably be permanent, whose plans for the future have been shattered, whose families face a harsh set of realities. But because of IEEE/VTS, as you now read this, there are 10 much happier engineers, and their families - in Detroit; not to mention the engineers in Houston, in New York, in Rapid City, in Santa Clara, in DC - the IEEE engineers who proved that the IEEE can make a difference - the engineers who collaborated on the VTS/PAC project.

IEEE Vehicular Technology Society

Directory of Chapters and Chairpersons

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None

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MONTREAL

None

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Chapter News

Sam McConoughey
Chapter News Editor

30th ANNUAL CONFERENCE-Recognition & Awards Luncheon

Avant Garde

The founders of our Society were honored at a luncheon hosted by the President and the Board of Directors during the Convergence 80/VTS30 conference in Dearborn, MI. on September 15.

The Society established an Avant Garde award with certificates and medals presented to the forty or so identified founding members and industry supporters of whom twenty were in attendance at the luncheon.

Mr. Walter Williams presented a brief review of the history of the founding of the IRE Professional Group on Vehicular Communications, forerunner of the present Society. Messrs. John McCormick, Fred Link and others also contributed recollections of the early days of the IRE-PGVC.

Messrs. R.J. Evans and T.P. Rykala acted as Committee members in locating, contacting and registering founding members for the conference. Mr. Evans also compiled a brief history on the origin of the Society

which appears elsewhere in this issue. Mr. Homer Penhollow provided considerable assistance in compiling the early history and even had a copy of the registration list of attendees at the first annual conference held in Detroit on Nov. 3 & 4, 1950! Mr. John McCormick's remarks will be published in the next issue of the Newsletter.

Chapter of the Year and Other Awards

At this same luncheon awards were presented to:

Mr. Carl N. Brooks, Chairman
Cleveland Chapter
"CHAPTER OF THE YEAR"
for the period 9/1/78 to 8/31/79

Mr. Alvin M. Goldstein, Chairman
29th IEEE Vehicular Technology Conference
Arlington Heights, Ill.
March 27-30, 1979

Mr. Louis L. Nagy, Chairman
South East Michigan Chapter
Co-sponsoring Convergence 78

CHAPTER NEWS

Cleveland

Sept. 1, 79- Aug.31, 1980 season
"Automotive Electronics-Where Are We Going?"
by W. F. Haagen
TRW Worldwide
Held on April 16, 1980
With 16 attending, including 7 guests.

Denver

"Denver's Own Electric Car Manufacturer"
by Bill Eve, V.P., Sales & Service
Unique Mobility, Inc.
Held on Apr. 16, 1980
Attendance not reported.

"Modulation and Demodulation Techniques for Voice Grade Data Transmission"
by Dr. Richard D. Gitlin
Bell Labs, Holmdel, N.J.
Held on April 18, 1980
Attendance not reported.

"What's New in 800 MHz Trunking Systems"
by John Wiens, Engineering Manager
Motorola C & E, Inc.
Held on May 21, 1980
Attendance not reported.

Washington, D.C.

"Frequency Auctioning-The Economic Approach to Frequency Allocation"
by Nina Cornell, Chief, Policy & Plans
Federal Communications Commission
Held on Oct. 12, 1979 with 42 attending including 20 guests.

"Packet Radio Technology"
by Dr. Robert E. Kahn, Chief Scientist & Director
Advanced Research Projects Agency, Dept. of Defense
Held on Dec. 7, 1979 with 30 attending including 4 guests.

"VTS Mini-Conference Planning Meeting"
by Stuart Meyer, Conference Chairman
Held on Jan. 18, 1980 with 29 attending including 13 guests.

"1979 WARC: Present and Future"
by Arlan K. Van Doorn, Deputy Chief, Private Radio Bureau
Federal Communications Commission
Held on Feb. 8, 1980 with 25 attending including 3 guests.

"Cellular Radio and Spectrum Management"
by Elliot L. Gruenberg, President
Broadcom, Inc.
Held on May 9, 1980 with 27 attending including 5 guests.

and for the Sept. 1, 1980 to Aug. 31, 1981 season

"Planning the IEEE-VTS 31st Annual Conference"
by Stuart Meyer, Conference Chairman & Fred Link, VTS Chairman National Meetings Committee
Held on Sept. 4, 1980 with 31 in attendance with 7 guests.

ELECTION RESULTS for the 1980-81 Season

Washington, D.C. Chairman: Mr. Neal Pike
Federal Communications Commission
Room 5120
1919 M St. N.W.
Washington, D.C. 20554
(202) 632 7597

Vice-Chairman: Mr. Daniel J. Davies
RCA Corp.
1901 N. Moore St.
Arlington, VA. 22200
(703) 558 4611

Secretary: Mr. Maurizio (Pete) Fiorio
Dettra Communications, Inc.
2029 K St. N.W., Suite 505
Washington, D.C. 20006
(202) 223 4664

TO CHAPTER CHAIRPERSONS

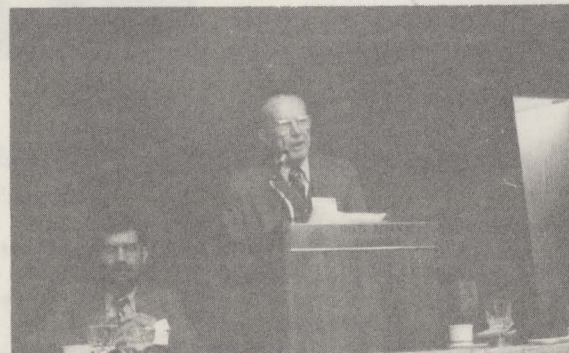
We are beginning our 1980-81 Season and your planning for this year's meetings should be well underway. We welcome the newly elected officers, but don't forget to tell your Secretary that one of his first duties is to report the election results to this Chairman and Committee. Also instruct your Secretary to forward a copy of the IEEE Meeting Report following each meeting so that it may be reported here. Remember too that it is the count of meetings and attendance reported in this column that is used to determine the Chapter of the Year Award. Also, don't forget that your Society sponsors the transportation for the Speaker of the Year. The local chapter has only to pick up the tab for the local living expense. As we have suggested before, contact the Speaker of the Year early and make arrangements to have him speak to one of your meetings, preferably a joint meeting with the Section or other Groups or Societies.

SPEAKER OF THE YEAR

Mr. Charles A. Higginbotham
7757 Conservatory Drive
Sarasota, FL. 33580
(813) 355-1813

And, as reported in the last issue, we expect shortly the names of other persons who will help "Uncle Charlie" in filling the role of a Speaker of the Year.

by Sam McConoughey, Editor &
Gaspar Messina
Jim Evans
Ted Rykala
Who rendered valuable support.



Brief Historical Facts on the Origin of the Vehicular Technology Society

In 1949 a small group of far-sighted IRE members formed what is today called the Vehicular Technology Society. Mr. A. B. Buchanan, then of Detroit Edison and Mr. E. C. Denstaedt of the Detroit Police Department were both officers in the IRE Detroit Section and worked diligently towards the original Group formation. A number of other persons from Detroit and on a National level assisted in this first endeavor.

The records indicate that the Group was first named, The Vehicular and Railroad Group. It was formed on April 5, 1949. In July of 1950 the name was changed to the IRE Professional Group on Vehicular Communications.

Membership in the PGVC grew rapidly after the Group formation. Records indicate that on June 1, 1950 there were 184 members, on December 20, 1950 there were 393 members and by February of 1951 the members stood at 413.

The membership fee for PGVC in 1951 was two dollars, however, Dr. Austin Bailey advised the Group that this must be a membership assessment, since IRE did not authorize a Group to collect dues.

The first ADCOM Committee of the Vehicular and Railroad Communications Group was appointed in July of 1949 and consisted of the following persons:

R. C. Stinson	Dr. C. N. Kimbass	A. B. Buchanan
E. H. I. Lee	F. T. Budelman	E. C. Denstaedt
Dr. D. E. Noble	Waldo Shipman	H. E. Weppler

Homer Penhollow, Secretary.

In March of 1950 Mr. Weppler resigned from the committee and Dr. Austin Bailey was appointed in his place.

The Group held an election in the summer of 1950 and the following members were elected:

Dr. Austin Bailey, CH	A. B. Buchanan
Fred T. Budelman, V. C.	E. C. Denstaedt
George M. Brown, Sec.	E. H. I. Lee
C. N. Kimbass	R. C. Stinson
W. A. Shipman	

These members would serve until June 30, 1951. The first set of Group by-laws were proposed on October 16, 1951 by some of the above members and assistance of IRE Headquarters.

The first local chapter of the Group was formed in Detroit on November 18, 1949. The records for 1951 indicate that the Officers and Committee members of the Detroit Chapter include the following:

R. L. Brown, Chairman
J. E. McFatrige, Vice Chairman
R. L. Casselberry, Sec-Treas.
T. P. Rykala, Publicity
C. E. Lien, Papers and Meetings
A. L. Coates, Membership

NATIONAL MEETINGS

The first National Conference of PGVC was held in Detroit Michigan on November 3 and 4, 1950. The first day consisted of technical papers presented. Chairman of the technical sessions was Mr. E. C. Denstaedt, then Inspector of the Detroit Police Department. The abstracts of the papers and other conference matters was recorded by Mr. Homer Penhollow, National Secretary.

The papers presented at the first Conference were as follows:

1. Private Line Microwave, Henry Magnuski, Motorola.
2. Experimental Radio Telephone Service for Train Passengers, Newton Monk, Bell Telephone Labs.
3. Automotive Manufacturers Problems with Respect to Control of Voltage for Mobile Radios, Raymond Eddy, Chrysler Corp.
4. Frequency Allocation Problems in Police Service, E. C. Denstaedt, Detroit Police Department.
5. Instantaneous Peak Modulation Limited Amplifiers for Phase Modulated Transmitters, F. M. Hartz, Detroit Edison Company.
6. 3000 Watt FM Radio Transmitter, WM. James A. Craig, Link Radio Corp.
7. Automatic Frequency Repeater System, James A. Craig, Link Radio Corp.
8. Pipe Line Radio, Waldo Shipman, United Fuel and Gas Company.

These papers outlined major electronic system design, problems and corrective measures that were of importance to Group members of the 1950 era.

The second day of the Detroit Conference, November 4, consisted of a "Round Table Conference" for the discussion of three major topics, previously selected as the most popular by the Group members attending the Conference. Dr. Austin Bailey of the American Telephone and Telegraph Company acted as moderator of the panel. The topics discussed were:

1. Frequency Deviation and Methods of Measurement
2. Equipment Maintenance Practice
3. Radio Interference

The second local chapter to be organized was in Chicago and this Group agreed to host the 1951 National Conference. The Chicago chapter was organized on June 29, 1951 with the following three persons elected as officers:

R. V. Dondanville, Chairman
K. V. Glentzer, Vice Chairman
W. J. Weisz, Secretary

The Chicago National Conference was held on October 25 and 26, 1951. Mr. Eugene S. Goebel, served as the Chairman of the Committee on arrangements. Interesting papers on different phases of mobile communications were presented by: G. C. Terrel, L. P. Morris, M. E. Bond, J. R. Byrne, R. H. McRoberts, A. A. Macdonald, H. H. Davids,

M. R. Friedberg, C. P. Williams, D. W. Bodle, J. S. Brown, and H. K. Lawson.

Material gathered and assembled by:
R. J. Evans, 9/19/80

Board of Directors Report

Samuel A. Leslie
VTS Secretary

ROLL CALL

The third board meeting of the year was held in conjunction with the CONVERGENCE '80/VTS-30 Conference. The meeting was called to order at 2:30 PM, with 17 being present.

MINUTES OF LAST MEETING

One correction to the minutes of the last meeting (June 13) was made, where the vote to provide funds for a cumulative index should have read "The Board voted to provide funds for the preparation through camera ready copy of a VTS Transactions cumulative index going back to 1952". Publication costs were not covered by this budget. McClure then moved, Fenton seconded that the minutes of the June meeting be approved as corrected, with the vote being unanimous in favor.

COMMITTEE REPORTS

Committee reports and problems were then discussed, with the following being covered:

a. Publications Committee Chairman: A request from the IEEE Press Editorial Board to broaden the content of the proposed IEEE Press Book on Propagation was noted. After Board discussion, it was determined that the emphasis of the book should remain on mobile propagation factors, and that McClure should proceed as originally planned.

McClure also discussed a proposal for sponsorship of an IEEE Press Book on "Spread Spectrum Mobile Communications". Lynk moved, Link seconded that VTS should sponsor such a book. The Board vote was unanimous in favor.

b. Education Committee Chairman Rule reported that there was not enough interest to warrant a short course on Transportation Systems.

c. Newsletter Editor: Johnson reported that the deadline for publication conflicted with the timely inclusion of events from the VTS-30/Convergence '80 conference. The deadline was extended to September 30 for camera-ready copy.

d. Awards Committee Chairman: Neubauer reported that VTS only has two candidates for Fellow grade this year. Also, no

candidates for "Honorary Member" status were presented, where VTS usually has two or so candidates a year. Per direction from Madden, Neubauer is to include a memo for inclusion in the newsletter on this matter.

e. Standards Committee Chairman: Neubauer reported that one IEEE standard is in the proofed copy stage, and that two others are in the revision process.

f. Paper of the Year Committee Chairman: Lynk reported on a conflict with the VTS Bylaws with present board's policy of awarding paper-of-the-year awards based on the three areas of interest (transportation, automotive electronics, and communications). Madden assigned Lynk and Neubauer to form a committee to look into modification of the bylaws, with a report to be prepared for the next meeting.

g. PAC Chairman: Edgerton reminded those board members who were not of senior member status to press on with their applications. Application forms were distributed to those present who did not have them.

OLD BUSINESS

The following items of an old business nature were covered, with reports and results being summarized as follows:

a. '81 Conference: Meyer reported that the date for the next VTS conference has been firmed up to be April 6-8. He then issued a verbal call for inputs from the transportation and automotive representatives on the board regarding what should be included in the next conference. Meyer then moved, Lynk seconded, that VTS advance an additional \$1000 to the Washington D.C. Chapter to support the '81 conference. This is in addition to an earlier 250-dollar advancement for incidental expenses relating to the upcoming conference. The Board vote was unanimous in favor.

Brooks moved, Chriss seconded, that the Washington IEEE section be allowed to participate in the '81 conference for a value not to exceed 20% of the proceeds. Nine voted in favor, one opposed; with McClure noting that support of chapter activities from the section level is at best minimal.

b. Road '81 Conference: No report at this meeting.

c. '82 Conference: Goldstein reported that the date for the '82 conference has been changed to May 23-26 to avoid a conflict with another conference. The conference is tentatively scheduled to be held at the Town & Country Hotel in San Diego.

d. '83 Conference: Link reported that Cleveland is the most viable location for this conference at this point. Claes and Brooks were then given an assignment to further investigate the viability of the Cleveland chapter hosting the '83 conference, with a report to be submitted in time for the next board meeting.

Toronto was mentioned as a possible alternative if Cleveland is unable to participate. Goldstein was given an assignment of following up on the Toronto question to see if the Toronto Chapter would be interested in participating.

e. Society Awards Programs: Goldstein reported that the Noble Award program at present is in limbo. A committee consisting of Goldstein, Fenton and Brooks was formed to resolve the qualification criteria for recipients of this award. Brooks was also given the assignment of contacting the appropriate people at the IEEE institute to explore the possibility of a graduate fellowship.

f. Nomination of Candidates for 1981-1984: The problem of lack of representation on the Board from the Automotive and Transportation segments of the Society was discussed. T. O. Jones is to provide at least four candidates from the Automotive sector of VTS, while Fenton, Rule, and Bender are to caucus the transportation sector for at least a couple of candidates. A slate of around ten well-qualified candidates to fill the five upcoming Board vacancies by election is planned. These candidates are to be submitted as soon as possible to allow the timely distribution of ballots.

Madden (acting chairman of the nominations committee) will assume the task of re-examining the methods by which board members are nominated, and to determine which methods provide the most equitable distribution of candidates. This will be an ongoing task to be completed next year.

g. Speaker of the Year: McConoughey reported that, in addition to Charles Higginbotham,

Fred Link and Jerry Stover have agreed to participate in the Speaker of the Year program. McConoughey was then given the assignment of contacting Trevor Jones and Ted Schaller for names of automotive types that would be willing to participate in the Speaker of the Year program.

Meyer then moved, Link seconded, to increase the funds made available for speaker travel assistance from \$2000 to \$2500 per year, primarily to accommodate recent air fare increases. The Board vote was unanimous in favor.

h. ADCOM Reorganization: Fenton discussed his report on reorganization, and voiced some reservations with the method of assigning titles. Meyer then moved, McClure seconded, that the Board accept the report with Fenton to continue coordinating with IAS and to continue refining the remainder of the details on reorganization. The Board vote was unanimous in favor.

NEW BUSINESS

Three additional subjects were added to the New Business Agenda:

- Vehicular Technology R & D
- TAB Finance Committee
- Electric Vehicle Conference in Baltimore, October 1981.

There was not enough time to discuss these new subjects nor the upcoming committee appointments, which was already on the agenda. These items will be discussed either via correspondence or will be taken up at the next meeting.

The next Board meeting will be held at Lake Buena Vista, Florida (near Disney World) on December 8, 1980, at the Howard Johnson Hotel.

ADJOURNMENT

The meeting was adjourned at 5:45 PM.

Respectfully submitted,

Samuel A. Leslie
Samuel A. Leslie
IEEE-VTS Secretary

Fred Link and Jerry Stover have agreed to participate in the Speaker of the Year program. McGonoughy was given the assignment of contacting Trevor Jones and Ted Schaller for names of automotive types that would be willing to participate in the Speaker of the Year program.

Meyer then moved, Link seconded, to increase the funds made available for speaker travel assistance from \$2000 to \$3000, primarily to accommodate the Board vote.

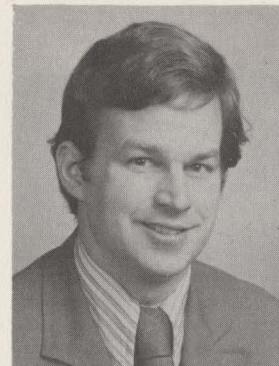
BOARD OF DIRECTORS 1980 MEETING ATTENDANCE

- Executive Committee

* - Appointed Board Members

NAME	FUNCTION	0	3	5	8
#Roger Madden	President	X	X	X	
#Stuart Meyer	Vice President	X	X	X	
#William H. Chriss	Treasurer	X	X	X	
#Samuel A. Leslie	Secretary	X	X	X	
#John Cassidy	Chairman, Const. & Bylaws Comm.	X	X	X	
#Trevor O. Jones	Chairman, Automotive Electronics Committee	X	X	X	
Fred M. Link	Chairman, National Meetings Committee	X	X	X	
*Eddie Simon	1982 Conference Chairman	X	X	X	
*Al Goldstein	1982 Conference Coordinator	X	X	X	
Samuel R. McConoughey	Chairman, Chapter Activities	X	X	X	
*Kenneth R. Leonhardt	Chairman, Publicity Comm.	X	X	X	
Carl N. Brooks	Div. II Rep. to TAB Finance Committee	X	X	X	
*David Talley	Financial Advisor	X	X	X	
Ronald G. Rule	Education Committee	X	X	X	
Robert E. Fenton	Chairman, Reorganization Committee	X	X	X	
*Virginia Edgerton	Chairman, Prof. Activities	X	X	X	
*Jay Kitchen	Chairman, Newsletter Adv. & Exhibits Committee	X	X	X	
*Jack R. Neubauer	Chairman, Awards and Standards Committees	X	X	X	
Charles Lynk	Chairman, Paper of Year Comm.	X	X	X	
*Charles D. Bodson	Standards Committee	X	X	X	
James J. Mikulski	VTS Rep. IEEE Comm. on Social Implications of Technology	X	X	X	
*Kent Johnson	Newsletter Editor	X	X	X	
George F. McClure	Chairman of Publications Comm. and Transactions Editor	X	X	X	
*James G. Bender	Assoc. Trans. Editor, Transportation Systems	X	X	X	
*William C. Y. Lee	Assoc. Trans. Editor, Communications	X	X	X	
*CDR. R. H. Cassis	Council on Oceanic Eng.	X	X	X	
*Martin Cooper	Member-at-Large	X	X	X	
George J. Mitchell	Member-at-Large	X	X	X	
Manuel Mayobre	Chapter Chairman, D.C.	X	X	X	
David Claes	Chapter Chairman, Cleveland	X	X	X	
F. A. Furfari	IEEE Div. II Director	X	X	X	

TOTAL ATTENDANCE 19131



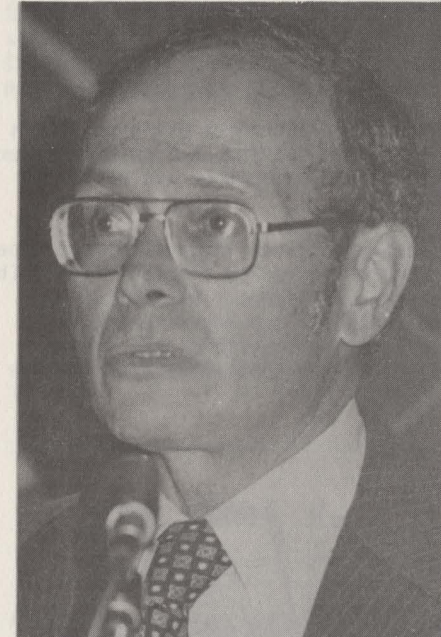
Automotive Electronics

Dateline: Detroit

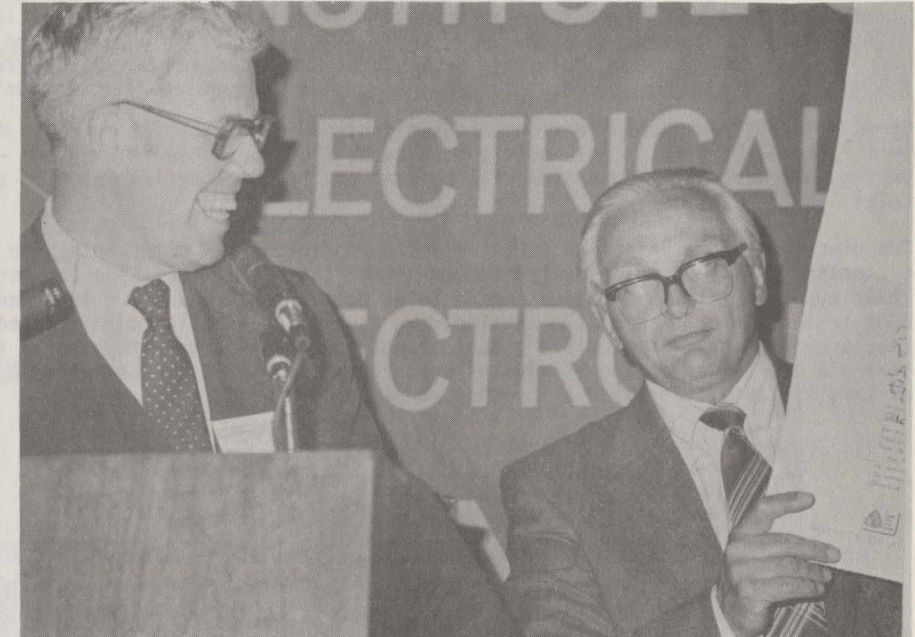
Bill Fleming
Automotive Electronics Editor

CONVERGENCE '80, THE 30th ANNUAL VTS CONFERENCE

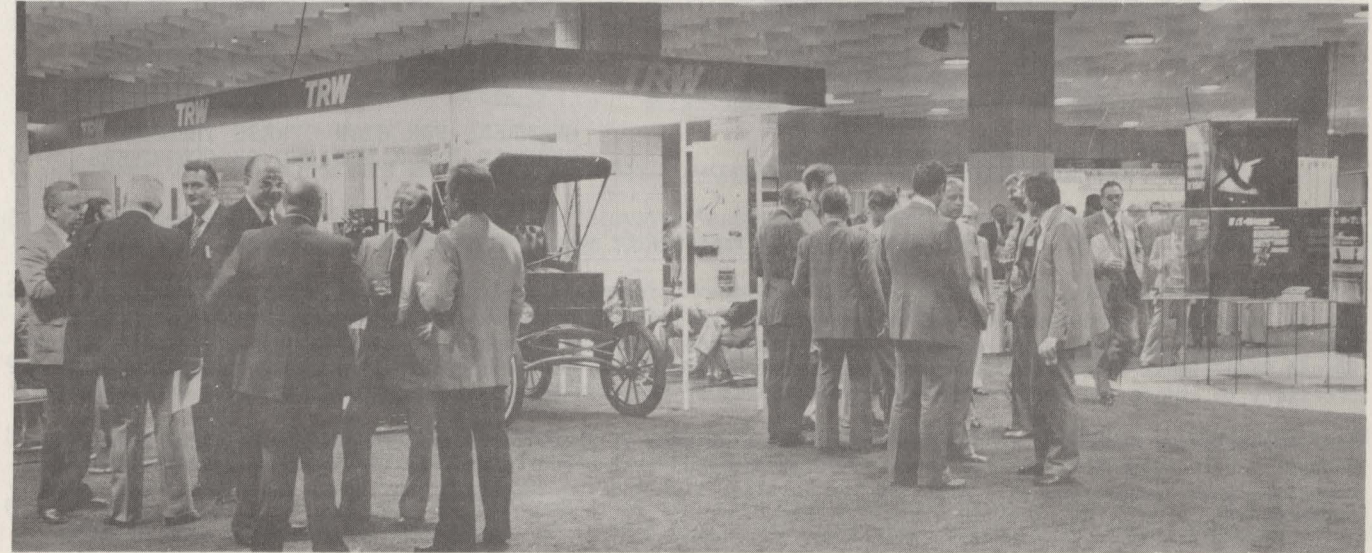
The joint 30th Annual VTS Conference/Convergence '80 Meeting proved to be an international success. Attendees came from 31 states, including Hawaii; and eleven countries, including New Zealand, Switzerland, Finland and Sweden. In total, about 1500 people attended Convergence '80. Some 100 technical papers were presented, about 50 exhibits were shown, and 18 electric and/or hybrid vehicles were demonstrated.



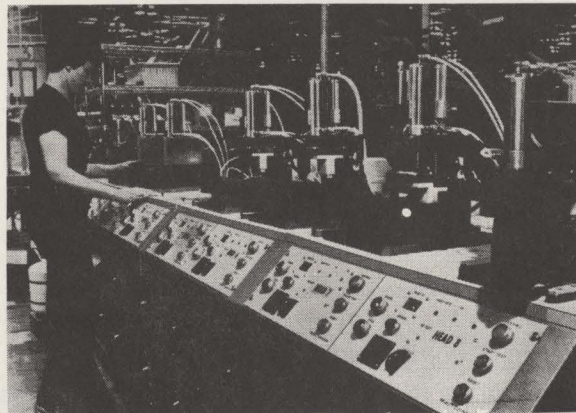
DR. FRANK PRESS
KEYNOTE SPEAKER



BENDIX AUTOMOTIVE ELECTRONICS AWARD
PRESENTED TO A. SCILLY OF LUCAS



50 EXHIBITORS FILLED ALL AVAILABLE SPACE AT THE CONFERENCE



100 % FUEL INJECTOR TESTING



FINAL EFI FUEL FLOW TEST

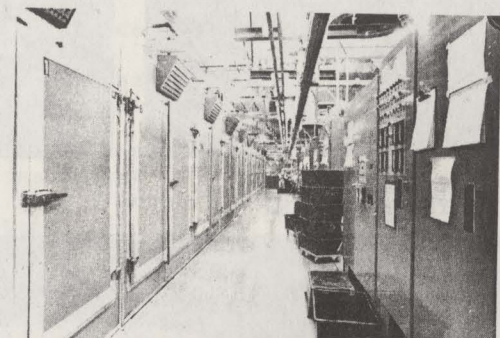
ELECTRONICS RELIABILITY AT CHRYSLER^{1,2}

Chrysler's most advanced electronic engine control is being built by their Huntsville Electronics Division. This is a fully electronic, single-point, continuous-flow fuel injection system -- the first continuous-flow EFI system in the auto market.¹ The system will be used on the '81 Imperial which is slated for a production run of 25,000 units.

The electronic fuel injection (EFI) assembly consists of 41 components; the assembly is given three different types of testing -- all of which are performed using "test fluid" gasoline (benzene removed to reduce flammability). The three types of testing simulate engine idle, full throttle, and two intermediate engine speeds. Assemblies are 100% tested; after passing the testing, the assemblies are placed in glassed-in racks for two hours during which they are purged of "test fluid", dust and other contaminants with mineral spirits. The Imperials' EFI system controls the fuel flow and eliminates need for a carburetor. Chrysler reports that the continuous-flow feature of this system will provide a smoother running engine.^{1,2}



"BED OF NAILS" COMPONENT PARTS PRESENCE TESTER

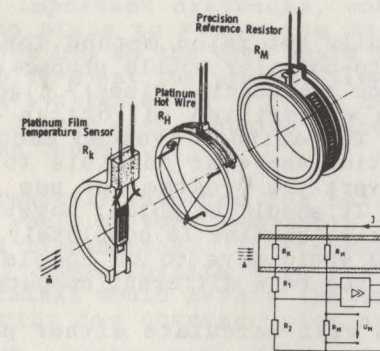


CHAMBERS FOR HIGH-STRESS THERMAL BURN-IN 100 % TESTING OF COMPUTERS

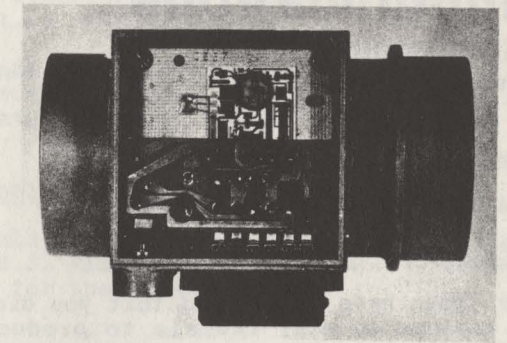
ELECTRONICS RELIABILITY AT GENERAL MOTORS^{3,4}

Digital electronic computers provide the precise control of automotive engines needed to satisfy performance requirements of the 80's. The computer rapidly responds to changing inputs, makes thousands of calculations per second, and almost simultaneously creates a number of accurately controlled output signals. Special efforts are necessary to assure the performance and survivability of these computers in the harsh automobile environment.^{3,4}

The computers are assembled and tested at a production rate of 25,000 per day. Incoming parts from vendors must surpass a 0.1% acceptable quality level. Custom-designed test chambers provide 100% burn-in exercising of the computers under conditions of: high and low voltage, high and low temperature cycling, and high-stress assembly burn-in.^{3,4}



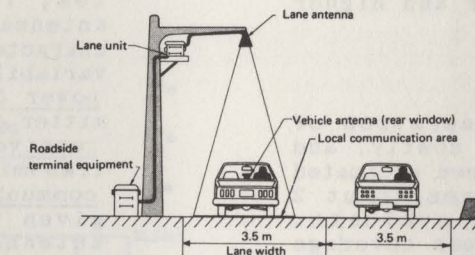
SENSOR COMPONENTS



SENSOR ELECTRONICS

ROBERT BOSCH HOT-WIRE MASS AIR FLOW SENSOR⁵

The hot wire mass air-flow sensor represents a significant improvement over a mechanical air flow sensor. During the development of this sensor, several serious technical problems had to be solved. Some of them were to avoid sediments at the platinum wire and to achieve sufficient mechanical strength of the very thin wire. The electronic control circuitry for the hot wire is installed in the sensor housing to achieve good cooling for the power transistor by the air-flow and factory calibration of the unit independent of the electronic control unit.⁵



TIME-COMPRESSED LOCAL VEHICULAR COMMUNICATION⁶

A time-compressed communication system using 60-GHz microwaves has been developed. In this system, 10-second aural information is time-compressed into 0.1 second and transmitted to the moving vehicle. The information is received and temporarily stored in the vehicle's unit. It is then reproduced to the driver in its original form. This system utilizes the directivity of microwave antennas in the vehicle and lane units to distinctly define local communication areas on the road. In addition, by virtue of the rapid operation of the microwave circuits; it enables information of high density to be transmitted and received at high speed.⁶

REFERENCES

1. K. Hamilton, "'81 Chryslers Get Bit of Space Age," *Automotive News*, July 28, 1980; p 44.
2. J. Webster and W. Henley, "Production and Automated Testing of Chrysler's Engine Control Computer," Paper 3, Session B-2, presented at Convergence '80 -- 30th Annual VTS Conference, Dearborn, Michigan, September 15, 1980.
3. K. Doversberger and R. Miller, "Testing Electronic Products," Paper 1, Session B-2, presented at Convergence '80 -- 30th Annual VTS Conference, Dearborn, Michigan, September 15, 1980.
4. K. Doversberger, "A Reliability Program for Electronic Engine Controls," SAE Paper 800895, presented at the West Coast International Meeting, Los Angeles, California, August 11, 1980.
5. H. Scholl, "Status of Automotive Electronics in Germany," Paper 2, Session B-1, presented at Convergence '80 -- 30th Annual VTS Conference, Dearborn, Michigan, September 15, 1980.
6. H. Endo, et al., "An Approach to Time-Compressed Vehicular Communications Using 60-GHz Microwaves," Paper 5, Session E-5, presented at Convergence '80 -- 30th Annual VTS Conference, Dearborn, Michigan, September 15, 1980.

Communications

Tom Rubinstein
Communications Editor

Automated Propagation Prediction

CSPM - A STEP IN THE RIGHT DIRECTION

Introduction

How many times have you wished that you didn't have to analyze so many radials to produce a coverage map? After you were done, how accurate do you think your result was? Probably not very accurate. After all, if you took 8 equally spaced 50 km (31 miles) long radials, the distance between adjacent end points would be 35 km (22 miles). Thus, the important disadvantages of manual calculation of mobile propagation are the cost and tedium of evaluating many profiles and the inadequacy of the results derived from any practical number of profiles.

An answer to both problems is to automate the preparation of coverage maps. Fortunately, an automated propagation prediction routine already exists. It is called "Communications System Performance Model for VHF and Higher Frequencies¹" or CSPM.

Background

It is clear that the manual generation of radio coverage maps is tedious, costly, and technically inadequate. It has been estimated that an average profile requires about 2 manhours to layout, plot, and evaluate. Assuming an average of 8 radials per coverage map, 16 manhours are required for each coverage map. Assuming a labor cost of \$25 per hour, a coverage map costs about \$400 to produce.

As we discussed above, for 8 equally spaced radials 50 km long, the distance between adjacent and points is 35 km. This is clearly inadequate. Okumura² implies that his prediction method is adequate over a radius of about 2 km. We can assume that this criterion is valid for other methods as well. Obviously, in flat areas, a small number of radials may be sufficient to represent the remaining area. In hilly or mountainous areas, however, this extrapolation is not valid so coverage maps generated from a small number of radials are only valid in the vicinity of those radials. If we were to draw enough radials to conform to Okumura's criterion, we would need 79 radials for a 50 km (31 mile) radius or 158 radials for a 100 km (62 mile) radius. At the latter rate, a single coverage map would cost \$7900 and would probably incite mutiny by any engineer selected to do the project.

We were not the first to notice these problems. The U.S. Army Communications Command, Communications Electronics Engineering Installation Agency (CEEIA) contracted with the U.S. Department of Commerce, Office of Telecommunications, Institute for Telecommunication Sciences (ITS) to produce a fully automated method of propagation prediction. The result was CSPM.

Description

CSPM is a fully automated method for predicting point-to-point or mobile propagation. It is based upon the Longley-Rice^{3,4} algorithm. The program was written in Fortran on a CDC computer. The authors avoided machine peculiar notation wherever possible to make it easy to convert the program for use on other computers. It should be noted, however, that the tape access routine is completely machine-peculiar and would have to be completely rewritten for use on a different computer.

The program will calculate either point-to-point paths or mobile propagation. The point-to-point capability is really just a cover program for Longley-Rice, whereas the mobile propagation capability (the "area" option) has several new, very attractive features. It provides output in either tabular or plotted form. Plotted output is obviously the more desirable format if a plotter is available, since plotted outputs can be made into overlays to be used on maps to indicate the propagation characteristics over an area. The model will plot any of the following characteristics:

- transmission loss, based upon a given set of transmitter coordinates, frequency, polarization, antenna heights, climate, ground characteristics, refractivity, and variability constraints.
- power density for a given transmitter and transmitting antenna
- received power level for a given transmitter, transmitting antenna
- communications reliability for a given transmitter, transmitting antenna, receiving antenna, and receiver threshold.

The communications reliability plot is probably the most useful for the plots for land mobile system designers. Figures 1 and 2 show examples of the latter 2 kinds of output plots. As stated above, these could be scaled and made into overlays for road maps.

The model attempts to keep the separation between radials to less than 1.57 km by increasing the number of radials up to 2048, as required. See figure 3.

So far, CSPM sounds super! Unfortunately, it is not without drawbacks. The data base it was written for has a horizontal resolution of 30 seconds and a vertical resolution of 200 feet. We feel that this granularity is unacceptable. Its currently being rewritten the model for use with a data base with 3 second horizontal and 200 foot vertical resolution. This brings the horizontal resolution to an acceptable value, but it is our opinion that a vertical resolution is marginal for producing accurate results.

After further investigation, we discovered that the U.S. Department of Interior, Geological Survey (USGS) is beginning a program of digitizing data from 1:24000 scale maps. This program is called Digital Elevation Model^{5,6} (DEM). The resultant data has a horizontal resolution of 30 meters and a vertical resolution of 70 feet. This resolution should be

acceptable for nearly all applications. It has three important drawbacks, however: 1) ITS has no plans to write the tape access routines for DEM so the user would have to do this himself; 2) at the present time, DEM data is not yet available for a great deal of the U.S.; and 3) DEM data occupies a great deal of space. See table 1.

CSPM is presently intended for batch processing. It would be very desirable to make it capable of timesharing. If timesharing were available, compatibility with plotting on a Diablo terminal would permit the timesharing user to print his coverage plot at the terminal.

The cost of single run has been variously estimated between \$5 and \$20. This compares very favorably to the cost of manually producing a far inferior product.

The CSPM program has now been set up for NTIS access.

Conclusion

CSPM has excellent capabilities to provide accurate, inexpensive coverage maps. Desirable improvements include the following: 1)

compatibility with DEM data, 2) compatibility with timesharing, 3) plotting on Diablo terminal.

Anybody with experience on or interest in this program is encouraged to contact me to promote an interchange of ideas.

Acknowledgement

I would like to thank Mr. R.D. Jennings, and Ms. S.J. Paulson of ITS and Mr. J. Yerozek of USGS for their assistance.

TABLE I
TAPE AVAILABILITY

Tape Type	#7.5 Minute Quads/Tape
9-Track, 6250 BPI	150
9-Track, 1600 BPI	40
9-Track, 800 BPI	20
7-Track, 800 BPI	15

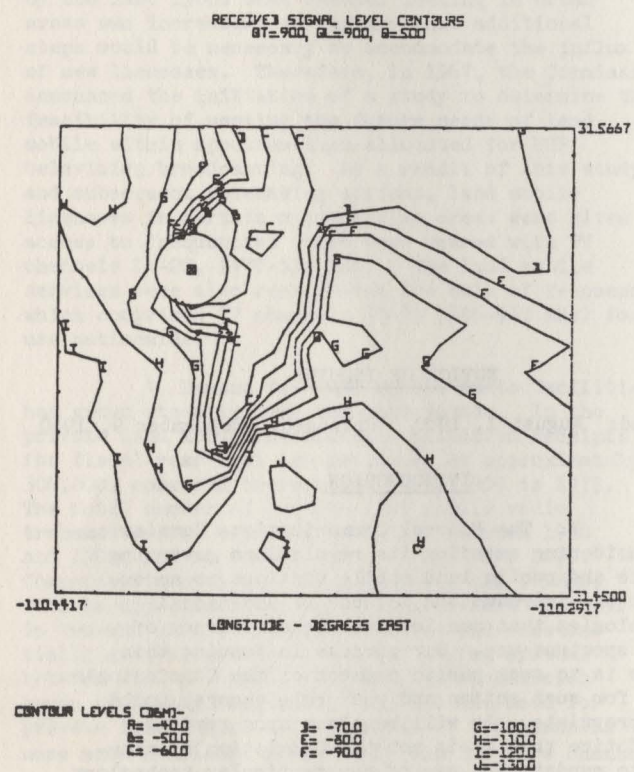


Figure 1
Received signal level contours for V2 = (.90, .90, .50).
Typical application of the CSPM in the geographical area mode.

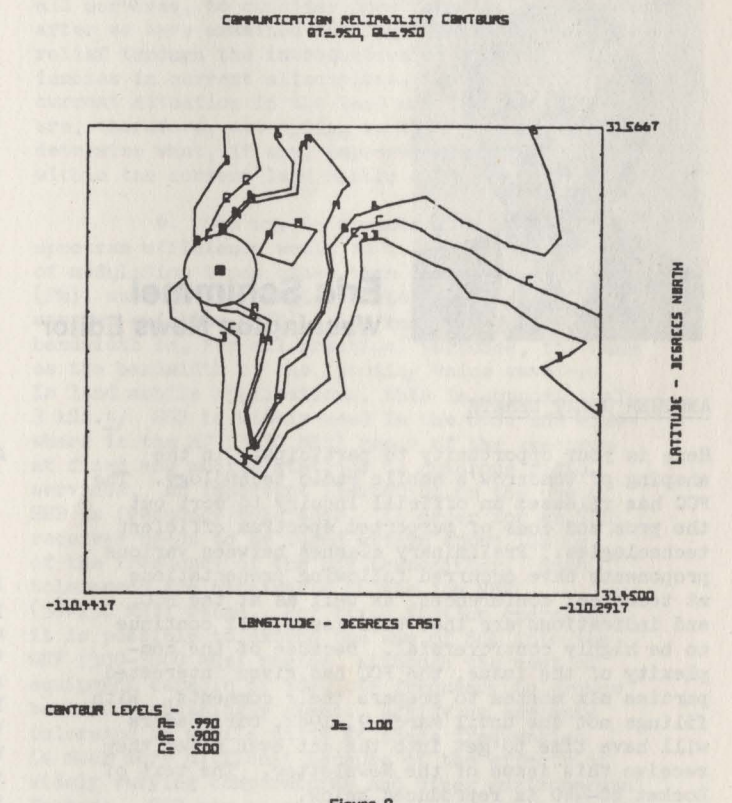


Figure 2
Communication reliability contours for V1 = (.95, .95).
Typical application of the CSPM in the geographical area mode.

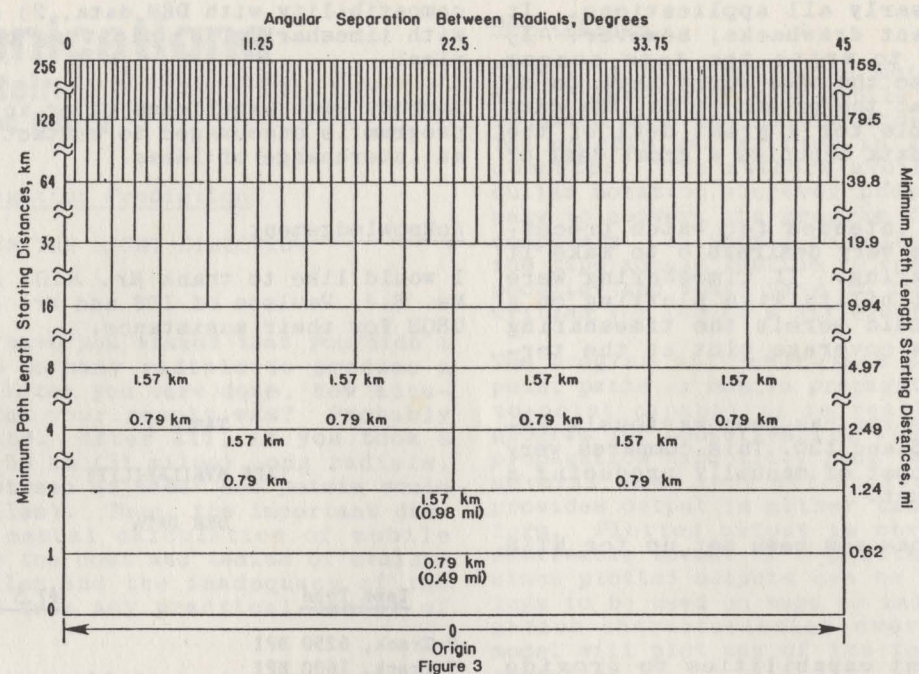
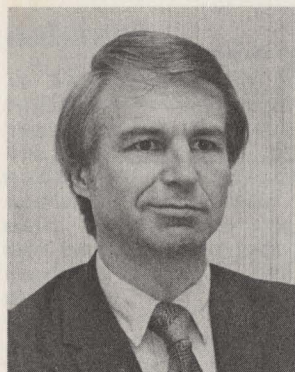


Figure 3
Pictorial presentation of minimum path lengths, angular radial separations, and point separations for radial method.

News from Washington



Eric Schimmel
Washington News Editor

ANOTHER GREAT DEBATE

Here is your opportunity to participate in the shaping of tomorrow's mobile radio technology. The FCC has released an official Inquiry to sort out the pros and cons of purported spectrum efficient technologies. Preliminary clashes between various proponents have occurred following presentations at technical conferences, as well as at the FCC, and indications are that this issue will continue to be highly controversial. Because of the complexity of the issue, the FCC has given interested parties six months to prepare their comments. With filings not due until March 9, 1981, our readers will have time to get into the act even after they receive this issue of the Newsletter. The text of Docket 80-440 is reproduced below.

Amendment of the Commission's)
Rules governing land mobile)
radio stations to provide for) PR Docket 80-440
additional technologies which)
can improve the efficiency of)
radio spectrum use.)

NOTICE OF INQUIRY

Adopted: August 1, 1980 Released: September 9, 1980

INTRODUCTION

1. The Federal Communications Commission is considering amending its regulations governing private and public land mobile stations to accommodate the introduction and use of additional technologies that can improve the efficiency of radio spectrum use. Our purpose in issuing this Notice is to seek public comment on the Commission's basis for such action and what rule changes would be appropriate. It will be clear upon reading this Notice that it is not the Commission's intention to mandate the use of any particular technology, but rather to provide greater freedom and incentive for licensees to make selections that, while in their own best interest also lead to greater efficiency in spectrum usage.

BACKGROUND

2. The allocation of frequencies for what are now known as the land mobile radio services

dates to the earliest years of the Commission. In Docket 3929, adopted October 13, 1937, the Commission set aside channels for police, special emergency, forestry, power, motion picture and relay press uses. In all, some 111 channels were allocated on frequencies as high as 150 MHz. In Docket 6651, the Commission created the 3 basic categories of private land mobile services: Public Safety, Industrial, and Land Transportation. In Docket 8658 and 9046, the Commission set into motion the allocation of several low band (30-50 MHz) and high band (150 MHz) channels for the Domestic Public Land Mobile Radio Service (KPLMRS). By 1956, the Commission had set out rules for private and public land mobile uses of frequencies as high as 470 MHz, although the vast majority of licensees were operating in low band and high band. Also by 1956, the need for additional high band channels for both private and public stations had grown to the point where the Commission adopted rules which "split" the existing 60 kHz-wide channels into channels of 30 kHz width. In 1966, similar rules were adopted which split the 450 MHz channels from 50 KHz to 25 KHz. Subsequent to these actions the private 150 MHz channels (except Business Radio Service channels) were again split to create 15 kHz-spaced assignable frequencies (so-called "tertiary" channels), and the 450 MHz channels in the Business Radio Service were split to create assignable frequencies spaced 12.5 kHz apart for low power use on a secondary basis.

3. Despite the shift to higher frequencies in the spectrum and the splitting of channels to obtain more assignable frequencies, it became clear by the last 1960s that channel loading in urban areas was increasing so rapidly that additional steps would be necessary to accommodate the influx of new licensees. Therefore, in 1967, the Commission announced the initiation of a study to determine the feasibility of meeting the future needs of land mobile within spectrum then-allocated for UHF television broadcasting. As a result of this study and subsequent rulemaking actions, land mobile licensees in certain metropolitan areas were given access to frequencies which were shared with TV channels 14-20, (470-512 MHz). The land mobile services were also reallocated the bulk of frequencies which comprised TV channels 70-83 (806-947 MHz) for use nationwide.

4. Demand for land mobile radio facilities has grown steadily over the past decade. In the private land mobile services, application receipts for fiscal year 1981 are projected at approximately 300,000, compared to receipts of 115,000 in 1973. The total number of private land mobile radio transmitters is expected to double between 1980 and 1990, and to double again by the year 2000. Comparable growth has taken place in the DPLMRS, with an approximate annual growth of more than 15% in two-way mobile telephone service and substantially greater growth in one-way paging systems between 1966 and 1978. In 1976, the Commission began assigning channels in the 800 MHz band for private land mobile use. A total of 300 channels were made available immediately and 300 more channels were held in reserve. In major metropolitan areas the strong demand for land mobile channels has resulted in the very rapid assignment of available channels, to the point where it has been requested that additional channels be released from the reserve pool. No matter what disposition is made of the reserve channels, it is clear that only short term relief will be provided in heavily congested areas such as Chicago, Los Angeles and New York. In the 150 and 450 MHz private and public

bands, the quality of service available in metropolitan areas is decreasing as the number of users steadily increases, to the point where no additional communications capacity exists on many channels. Virtually no new private users can be accommodated on the 470 MHz channels because these are fully loaded in all cities where operation is permitted.

ALTERNATIVES FOR ACCOMMODATING FUTURE GROWTH

5. There are essentially two regulatory avenues for accommodating future land mobile growth:

- i) Allocate more spectrum for land mobile use; or
- ii) Provide for the introduction of greater efficiencies in the use of spectrum already allocated for land mobile.

From the foregoing it is obvious that both of these approaches have been used in the land mobile services in the past, in the form of allocations/reallocations/sharing of spectrum and in the splitting of channels and introduction of trunking. If the land mobile services are to continue to grow and furnish the very diverse and important communications services which will be needed in the future, it will be necessary for one or both of these mechanisms to be used again relatively soon. In general, we believe it is preferable, and in the long term best interests of all services, to consider spectrum reallocations only after we have examined the feasibility of providing relief through the introduction of greater efficiencies in current allocations. In assessing the current situation in the land mobile services, we are, therefore, attempting in this proceeding to determine what, if any, improvements are possible within the current land mobile allocations.

6. One way to promote greater land mobile spectrum efficiency would be to provide for the use of modulation types other than frequency modulation (FM), such as the single sideband suppressed carrier emission (SSB). Its radio frequency (RF) bandwidth is, for all practical purposes, the same as the bandwidth of the incoming voice waveform. In land mobile applications, this is approximately 3 kHz.^{4/} SSB is widely used in the U.S. and elsewhere in the HF (3-30 MHz) range of the spectrum at fixed and mobile stations in numerous radio services. An important limitation on the use of SSB is frequency tolerance. In order for an SSB receiver needs to be tuned within about 100 Hz of the frequency of the SSB transmitter. Such tolerances are attainable in the low VHF (30-150 MHz) range. For fixed station operation, it is possible to extend the use of SSB into the UHF (300-3000 MHz) region, although the cost of equipment capable of adequate frequency tolerance becomes increasingly great. Achieving adequate tolerance in mobile units at these frequencies is much more difficult because of the effects of widely varying temperatures and other environmental factors. SSB may be combined with speech bandwidth reduction techniques to reduce its occupied bandwidth below typical speech bandwidth. Some experimentation has been done in this area involving the use of SSB and frequency companding to generate an

^{4/} The bandwidth of a typical land mobile FM signal is 16-20 kHz.

SSB signal with roughly a 1.6 kHz bandwidth. Extensive work has also been undertaken involving the combination of SSB and amplitude companding (ACSB).^{5/} Under contract with the Commission, Dr. Bruce Lusignan of Stanford University has conducted laboratory and field tests of ACSB radios of his own design to determine the feasibility of ACSB for land mobile use. The results of that work are contained in six volumes submitted to the Commission.^{6/} From this preliminary information, it appears that ACSB may, in certain circumstances, be able to provide a communications capability comparable to FM while utilizing an assigned channel width of only 5 kHz. Among the performance features claimed in the reports are the following:

- (1) Channel spacing requirement for speech of 5 kHz or possibly less.
- (2) Intelligibility as good as that of conventional land mobile FM.
- (3) Received signal-to-noise ratio and quieting 10 dB or more improved over conventional FM.
- (4) Twice the coverage range of conventional FM for the same peak power for a typical user when noise-limited.
- (5) Automatic search and lock on desired signal in 0.25 seconds, with a significant tendency to reject undesired signals on the same frequency.
- (6) Improved response to deep rapid fading compared to conventional FM.
- (7) Lower transmitter power consumption than conventional FM for equivalent peak power output.
- (8) Squelch performance similar to conventional FM.
- (9) An existing licensee converting from FM to ACSB on a narrowband channel would improve his service by reduction of interference received from FM stations and the FM stations would improve their service by his having moved and changed to ACSB.
- (10) When ACSB channels are first made available, a new licensee would always receive better service in a narrowband channel than on an FM channel.
- (11) The one (at 450 MHz) or two (at 150 MHz) channel(s) which fall midway between the current FM channel centers constitute essentially unused spectrum for narrowband operations.

7. In addition to SSB and ACSB, there are, of course, other radio transmission techniques that could be used for land mobile communications (voice and/or non-voice) which require less bandwidth than conventional FM.^{7/} We will

^{5/} Amplitude companding is a process whereby the amplitude of loud speech syllables is reduced and amplitude of quiet speech passages is increased, resulting in a more uniform speech waveform signal-to-noise ratio. At reception, amplitude expansion restores the amplitudes of the speech waveform to their original levels.

^{6/} These volumes are: (i) The Use of Amplitude Companded SSB in the Mobile Radio Bands; Final Report (PB80 215759); (ii) Spectral Efficiency of FM and ACSB Radios (PB80 215767); (iii) Analysis, Design, and Performance Evaluation of a Single Channel ACSB System (PB80 215775); (iv) Convenience Circuits (PB80 215783); (v) Rhyme Test Performance of ACSB, Narrowband, and FM Radios (PB80 215932); (vi) The Use of Amplitude Companded SSB in the Mobile Radio Bands: A Progress Report (PB80 215791). These volumes are available from the National Technical Information Service, Springfield, Virginia, 22161, tele. 703-557-4690. The numbers in parenthesis above are the NTIS numbers to be used when ordering the volumes.

not pursue a discussion of those techniques here, inasmuch as information on them can be found in available technical and professional publications. Additionally, we are aware that there are developmental efforts underway in this area and we hope that this Notice will serve to stimulate these efforts and demonstrate the Commission's interest in them. The point we wish to make is simply that FM, while very useful for land mobile communications, is only a variety of emissions which could serve various licensees needs, and we therefore believe that any effort to investigate and formulate means of increasing the efficiency of land mobile spectrum usage must necessarily take this fact into account. By and large, the Commission's current land mobile technical standards and channel assignment plans are predicated on the use of FM, and, by heretofore restricting the freedom of access of land mobile users to alternative emissions, the Commission may have unintentionally contributed to inefficiencies in spectrum usage.

THE INQUIRY

8. We believe it is now timely and appropriate for the Commission to investigate the desirability of amending its rules to provide for the introduction and use of alternative technologies for land mobile communications. We would again emphasize that the purpose of this proceeding is not the mandating of new technology; rather, we believe it is far preferable to restructure our rules to permit the voluntary introduction of whatever technologies are appropriate for land mobile communications based on the needs of land mobile users. With only minor exception, there has really been no incentive in the past for use of narrowband communications equipment in the land mobile bands because the user could not benefit directly from the spectrum "saved." It is our purpose in this proceeding to investigate means of providing incentives for spectrum savings by introducing mechanisms to permit the user to derive direct benefit from reducing spectrum occupancy. What follows is a partial listing of the topics on which we solicit comment, and a brief discussion of each.

Technology

9. The widespread use of FM will undoubtedly continue for some time after introduction of new technology. However, the Commission's actions will have a significant impact in the rate of adoption of new technology and the degree of difficulty and disruption which occurs during the transition period as narrower channels are added. We are eager to see the introduction of more spectrum efficient technologies for the benefit of mobile radio users and the general public, but we are also anxious to have the transition be as smooth as possible. Introduction of new technologies into bands presently dedicated to 25 or 30 kHz FM channels will require care to provide for simultaneous operation of wideband and narrowband systems.

10. We believe that the marketplace should play a role in selecting what technologies are appropriate for particular uses, so long as those technologies are spectrally efficient. In the

^{7/} e.g., double sideband (DSB, full or reduced carrier) and a wide range of digital techniques.

private mobile radio services, unlike services broadcasting to the public, we do not believe it is necessary for all transmitters to be compatible with all receivers. Therefore, it is conceivable that several narrowband techniques may ultimately exist simultaneously in the marketplace. It is clear in the case of land mobile that the choice of technology has largely been determined by a combination of technological state of the art and the amount of spectrum available for use. We feel that our part in the marketplace application of new technology in mobile radio services is to reaffirm by our actions that spectrum is becoming a more and more valuable part of the resource inputs to mobile radio services, and to assure users and the public that we will do our part in encouraging and permitting development and application of new technologies by the private sector. By means of this proceeding we hope to set in motion a process of developmental demonstrations and orderly introduction of new spectrum efficient technologies which will increase the number of available channels in the land mobile spectrum without unnecessarily disrupting the use of current channels. We ask respondents to provide information on the following issues and any other relevant to this process:

(i) What spectrum-saving technologies are suitable for voice/non-voice use? What bandwidths and technical standards are appropriate for these technologies?

(ii) Should the Commission continue to set specific technical standards for land mobile emissions? Based on what criteria?

(iii) What types of communications needs will these technologies meet and with what quality of service?

(iv) In what stage of development are these technologies and what timeframe would be appropriate for their introduction?

(v) With respect to the Lusignan study of ACSB, we invite comment on the following topics and any others which may aid our analyses of this material:

(a) To what extent is the information set Lusignan study useful in determining the feasibility of ACSB? What specific additions, deletions, or modifications should be made to this material?

(b) Are any further laboratory or field tests necessary to validate the conclusions specified? What resources and time frame would be required for these tests?

(c) Is ACSB suitable for land mobile use based on all of the information now available? In what frequency ranges could it be used successfully? What technical standards and emission limits should be set?

(d) How would ACSB compare to FM in terms of required frequency stability? Audio quality? Intelligibility? Occupied and necessary bandwidths? Fading characteristics? Mileage range (equal power levels) in the absence of interference? In the presence of interference? Suitability for hand-held units? Suitability for transmission of digital data?

(e) Is ACSB compatible with FM? What interference standards would be necessary for successful integration of the two modes?

(f) What would be the likely cost of ACSB equipment initially? In 5 years? Would industry be interested in building ACSB equipment? Under what conditions? Should the FCC act to stimulate the design, development, production and/or the ACSB equipment? How?

Assignable Frequencies

11. The channel bandwidths in the 30-50 MHz, 150 MHz, and 450/470/800 MHz bands are, respectively, 20 kHz, 30 kHz, and 25 kHz. In the 30-50 MHz range, adjacent channels are also spaced 20 kHz apart, whereas at 150 MHz the adjacent channel spacing is 30 kHz for the DPLMRS and 30 or 15 kHz for the private services, depending on the mileage separation between adjacent stations. At 450 MHz, the adjacent channel spacing is 25 kHz, except in the Business Radio Service, where it is 12.5 kHz. With one exception, all of the channel widths and spacings are multiples of 5 kHz. One possible course of action, therefore, could be the designation of assignable frequencies with uniform 5 kHz spacing throughout the bands for use by narrowband emissions, with one or more 5 kHz channels being assigned to a licensee, depending on the bandwidth required by the emission. The total number of standard bandwidth channels currently available in the 150/450 bands for private use is 283 and 324, respectively, excluding tertiary channels at 150 MHz. The overlay of 5 kHz channels would create 1698 and 1620 additional channels respectively, in the private bands. A similar five-fold increase in channels, to approximately 320, would occur in DPLMRS bands. Of course, given current usage of the bands, only some fraction of these additional channels could be put into use immediately. At 150 MHz, for instance, a prospective narrowband user would have to take into account for presence of all nearby primary and tertiary channel users, and select a narrowband channel which is compatible with those users. Any plan which would be implemented for overlaying additional channels would, necessarily, have to include interference standards and criteria for channel selection. It may also be possible to overlay systems of trunked narrowband stations, thus compounding the degree of efficiency obtained. We therefore ask respondents to consider the following points:

(i) Should the number of assignable frequencies be increased to accommodate narrowband emissions? If so, should a 'bandplan' be adopted for each narrow-band emission authorized for the various bands? Or should the narrowband assignments be made on a case-by case basis? What is the feasibility of trunked narrowband system of other types of multi-channel assignment systems offering automatic or manual channel selection to users?

(ii) What degree of interference protection (co-channel and adjacent channel) would be appropriate? Would a mileage standard, as now used in the 150 MHz private radio services for tertiary channels, be desirable?

(iii) Should there be a priority system for assigning the narrowband channels (e.g., current licensees first)? What should be the role of the frequency coordinators with respect to assignment of narrowband channels and 'rechannelizing' or current channels?

Incentives

12. As noted earlier, there is currently very little incentive for users to switch to narrowband technologies because they derive limited benefit from the spectrum "saved". The incentive which does exist, namely the ability to escape to some degree from currently congested frequencies, will no doubt increase as the number of users increases and the technology of narrowband emissions develops. It is quite understandable that no further incentives exist now because, with the current frequency assignment procedure and standardization of the FM emission, the only other way to save spectrum is to decrease the level of channel occupancy, through improved operating procedures or queuing techniques such as trunking. The benefits of such efficiencies, however, accrue to the land mobile community as a whole, with only a marginal benefit to the specific user(s) who make the improvements. A more desirable approach to this situation would involve linking spectrum efficiency with communications capability in such a way that the benefit to the specific user(s) implementing more efficient technology would at least equal the cost to those users of doing so. Such an incentive system could take several forms. For instance, the Commission could permit the licensee of an FM system to switch to a narrowband emission and yet retain authorization for all or part of the spectrum formerly occupied by the wider bandwidth emission. The licensee could establish a second system in this spectrum or use it as additional "guardband" from nearby users, or, if not needed for those purposes, it could be disposed of on the basis of its value to someone else needing spectrum, (i.e., by sale, lease, or trade). We solicit information on the following topics as well as any additional information respondents may wish to add:

- (i) Should the Commission institute some sort of incentive mechanism to reward users of spectrum-efficient technology? If not, are the current incentives sufficient to foster the growth of new technologies? If so, how?
- (ii) What form of incentives should be used for existing systems? For new systems?
- (iii) Should incentives be limited to certain emissions? Or certain frequency bands? Or certain geographical areas (e.g., congested areas)?
- (iv) What would be the disadvantages of using incentives? Could such a mechanism be phased-in without unduly disrupting the current licensing system? If so, how?

SUMMARY

13. It is evident from the foregoing that the scope of this inquiry is wide, and we certainly do not expect all the issues raised herein

to be resolved immediately. Rather, we intend this inquiry to be the first step in a process, possibly including further inquiry on these topics or others, which leads to a systematic integration of additional technologies and regulatory tools into the land mobile environment. Such an integration is a major undertaking which necessarily takes into account the current environment and the needs and capabilities of our licensees. In order to facilitate the introduction of technologies without undue delay when there is a sufficient interest in so doing, it is our intention to direct our primary attention initially to determining if there are any narrowband technologies on which development has indeed progressed to the point where provision should be made for them in our rules. If such a situation does exist, then it will be our intention to accommodate this usage without undue delay by whatever steps are necessary, including the issuance of developmental authorizations, rule waivers, rule amendments, etc. We urge respondents to address this matter fully in their comments, with specific emphasis on the technologies which can be brought into the marketplace in the near future. If, as strongly indicated in the results of the Lusignan study, ACSB is a promising near term technology, then we intend to move forward as quickly as possible to provide for its use.

14. It would indeed be beneficial for the Commission to receive as many evaluations of the Lusignan study as possible. Needless to say, much of this report is very technical and requires extensive analysis for a thorough understanding. Nevertheless, for the development of technical and interference standards should ACSB become operational, it will be necessary for us to incorporate thorough analyses of this material, and whatever additional material is developed on ACSB and other technologies, into the standard-setting process. It should be emphasized that the objective of these analyses should not be to determine whether ACSB, or any other narrowband emission, is superior to FM; rather, the analyses should focus on whether alternative narrowband emissions can, in various circumstances, provide a wholly adequate communications capability while using less bandwidth than FM. In other words, for the sake of example, let it be agreed that narrowband emission "X" is inferior to FM in, say, speech quality. This being the case, we can nevertheless see no good reason for prohibiting the use of "X" when there are users to whom speech quality is unimportant but to whom the benefits of narrow bandwidth are important. We believe it should be one of our goals to incorporate the maximum amount of flexibility into the land mobile rules so that licensees can be free to choose those spectrally efficient emissions which best fit their needs. While it is clear that the introduction of this flexibility will be very complicated process, it is equally clear that the long term viability of land mobile services depends on our moving in this direction without further delay.

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