



**IEEE**

**VEHICULAR TECHNOLOGY**

**SOCIETY NEWSLETTER**

FEBRUARY 1978

EDITOR: OLIN S. GILES

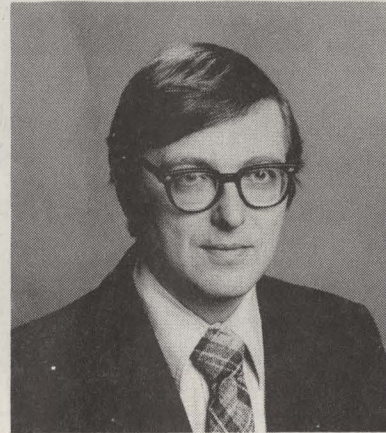
**28th ANNUAL VTS CONFERENCE**

**DENVER, COLORADO**

**MARCH 22-24**



## THE PRESIDENT'S MESSAGE



At the Administrative Committee meeting held in Los Angeles on December 6, 1977, a new slate of officers was elected to lead your Society\*. I was elected president and Roger Madden of the FCC was elected vice-president. Since many of you may not know me, a few words about my background are in order. At present I lead a group of engineers involved in automotive control systems research within the Electronics Department of the General Motors Research Laboratories. We are engaged in applying control systems theory and micro-processor technology in order to develop electronic controls for the automobile engine with the objectives of improved fuel economy and reduced exhaust emissions. I was elected to the Administrative Committee (AdCom) in 1973 and over the past four years served as treasurer and vice-president. Prior to that I was active in the Southeastern Michigan VTG Chapter and served as chairman for 1972-1973. On a personal note I am married and the father of two children.

Looking back since I became a member of your AdCom, I have seen substantial progress in a number of important areas. I believe this resulted from good leadership, definition of a five-year plan with specific goals, and the exemplary efforts of a number of people. You have been served well by your two previous presidents, Nick Alimpich and Sam Lane. A note of thanks is due your outgoing president, Sam Lane, for the excellent job he has done for the past two years. A few years ago, at an AdCom meeting in Minneapolis that lasted late into the night, we established a five-year plan with a number of specific goals related to among other things, Transactions, Newsletter, Conferences, and membership. Thanks to the exceptional efforts of teams lead by George McClure, Transactions editor, and Olin Giles, Newsletter editor, goals in these areas have been exceeded. Our conferences are improving each year as evidenced by the growing attendance and increase in number of technical sessions. Of the major objectives, only our membership goal (a 10% increase) was not achieved. In fact during the last year, we experienced a 2% decrease.

Looking ahead, I find that my personal philosophy is in line with the course chartered by my predecessors. I believe that the primary purpose of a technical society is to provide forums, both formal and informal, for exchange of technical information. To achieve this end I feel that our primary emphasis should continue to be on our publications and conferences. However, further progress depends on an active and growing membership. I'm sure that there are many out there who benefit from

\* As of January 1, 1978 the Vehicular Technology Group has been granted Society Status and became the Vehicular Technology Society.

our activities but for one reason or another are not members. Please make it your personal goal to add one member to our ranks within the next year. Also, we want more of you to become active in leading your society. Anyone who is interested in helping out, no matter what your background or talent might be, please contact me or any other member of your AdCom.

As I write this, I've just received the advanced program for our annual conference to be held in Denver, March 22-24, 1978. I'm impressed with the job that Herman Wells and his team have done. In addition to eighteen technical sessions containing almost 70 papers, there will be a wide variety of complementary activities as indicated below:

### A BIRDS-EYE VIEW OF LAND MOBILE RADIO AND VEHICULAR TECHNOLOGY WEEK (March 20-24, 1978)

National Business Radio Dealers Conference  
IEEE Vehicular Technology Society Conference  
IEEE Microwave Mobile Symposium  
IEEE Microprocessor Tutorial Course  
Radio Club of America and IEEE Denver Section Banquet  
Colorado Council of Amateur Radio Clubs  
Land Mobile Communication Council  
National Association of Business & Educational Radio  
Senior Communication Symposium, NABER  
IEEE Electromagnetic Compatibility Group  
Forest Industries Telecommunications  
Manufacturer's Radio Service Advisory Committee

Of special note is the scope of the technical program. In addition to the many sessions on communications, there are sessions on electric vehicles, automotive electronics, and for the first time in my memory a strong program of three transportation sessions. You can expect to see more of this in both our conferences and publications as these technologies mature and we improve our reputation as a forum to discuss and publish advances in these areas. Moreover, mobile communications has been and will continue to be a major part of our technical activities.

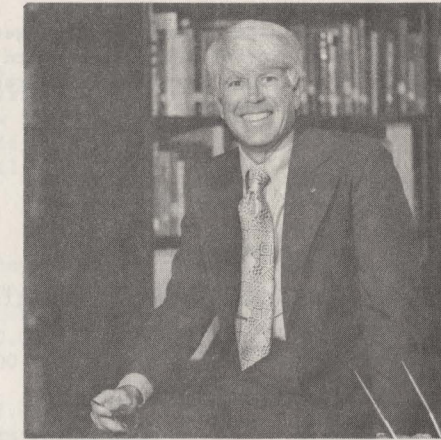
In conclusion, I'd like to hear from you. Please contact me with your comments, complaints, praise, or suggestions.

Happy New Year!

John Cassidy

Electronics Dept.  
GM Research Laboratories  
General Motors Technical Center  
Warren, Michigan 48090  
Phone: (313) 575-2849

## OUTGOING PRESIDENT'S MESSAGE



This will be my last message to you as President of your organization. Although the last two years have virtually whizzed by, I feel that your organization has made significant progress in serving its members and improving its status. In reviewing the activities of the past two years, I find it necessary to go back a little bit beyond that to the meeting of the Executive Committee on June 17th, 1974 in Minneapolis, Minnesota. If I can set the stage for you, at that time we had an organization that was in jeopardy of being disbanded or merged into another IEEE Society or Group. Our Transactions were considered inferior, they were not published on time, nor did they have more than two or three papers per issue. Our conferences were generally without any vitality, and being attended by a few hundred hard core, loyal members, and a handful of exhibitors. In addition to that, we were being pressed with financial difficulties due to the increase in publishing costs, and other services.

Against these significant obstacles, the Executive Group got together and spent a considerable amount of time, well past midnight, in a brain storming session as to how to improve the overall organization and survive as an independent entity. In this group we had Nick Alimpich, Tom McKee, Marty Cooper and myself, trying to devise a system and procedure to succeed. From this meeting we evolved an ambitious five year plan, which identified certain goals that we thought were feasible within five years. Many of our AdCom Group thought that these goals were far too optimistic for our limited capability and then current track record. I would like to list some of the key goals that we had established at that time.

1. Maintain our autonomy as the VTG.
2. Change from Group to Society status.
3. Improve the quality of our publications and aim for 400 pages in the Transactions per year.
4. Generate a special issue of the Transactions each year.
5. Aim for 500 attendees at the National Conference.
6. Provide a touring lecturer each year.
7. Increase our membership by at least 10% per year.

Significant action was immediately embarked upon to achieve these goals. Progress in every sector was taken and key individuals were identified to help along in the various activities of the group.

I can report with pride of the significant progress we have made to achieving what then seemed to have been an impossible task.

1. We are, indeed, a viable and autonomous group. There is no question at this point of our being merged into any other group within the IEEE, and we have retained our unique identity.

2. Consistent with our status as an independent group, we are, as of January 1st of this year, the Vehicular Technology Society. The change of name is far more significant than just the word Group to Society. This designation clearly distinguishes us as a separate and viable organization, serving its membership effectively and identified for future growth within the IEEE organization, and to the outside professional community.

3. The quality of our publications and especially the Transactions, have increased dramatically over the past few years. We are at the point of producing 400 pages in the Transactions per year. The Transactions are well received and have a representative group of quality papers that are being published in a timely fashion.

The Newsletter has become a quality journal that provides timely VTS, professional and related industry information to our members.

Either of the two publications above is worth the modest Society dues required of our members.

4. We have more than exceeded the goal of one special issue of the Transaction per year. In the past few years we had some outstanding special issues, including EMS Communications (Emergency Medical Services), Maritime Communications, Automotive Vehicle Monitoring and Position Location, and Mobile Radio Propagation. These issues have been recognized worldwide and are in demand by practitioners and professionals throughout the world. Many other special issues are being scheduled and we will continue to publish those issues that can best serve our profession.

5. We had exceeded the 500 attendees at the Annual Conference in Washington, and came very close to the 500 figure for the Orlando Conference, in spite of the remote location and the state of the economy at that time. It appears that our Denver Conference and succeeding conferences will go well beyond the 500 figure.

6. We have provided a touring lecturer and other renowned speakers in our field. In the past few years, eminent spokesmen for our industry such as W. Rae Young, Ken Guthrie, and Fred Link, have been designated as touring lecturer of the year, and have been well received throughout the country.

7. Unfortunately, our membership has not grown in accordance with the objectives and plans we had made. Just this last year we have shown a very slight decline of the overall membership, which has pretty much stayed the same for the past five years. At first we thought we had the same group of people remaining constant with us through these number of years, however, what we find is that we have a turn-stile effect, whereby many new members come into the organization, but they, in turn, are just replacing members that are leaving the organization. It has been hoped that through our other programs we will encourage more members to stay within the organization and we will find more things for them to relate to in so far as services, information and benefits are concerned.

All in all, it would appear that we have done exceedingly well in a three and one-half year period of what was originally thought of as highly optimistic goals to be achieved at the end of five years. Much, of course, has to be done, and I am sure the future officers will successfully improve the organization in years to come. The Adcom met this past December in Los Angeles and has elected John Cassidy as President of the VTS. John brings to the organization many credentials, and will be a positive influence on the entire organization. He has been associated with the Southeastern Michigan Chapter, which has been our banner chapter for the past few years. Being the most active and the most innovative of all of our chapters. In addition, John has worked his way through the chairs on Adcom, serving both as Treasurer and as Vice President for the past four years. Both his personal and professional track record seems to insure that our organization will be in good hands, and I wish him well.

I would also, at this time, like to thank the many members of Adcom who have served diligently and successfully in all of our endeavors the past few years. Space would not allow individual mentioning of names, but I am sure those of you who have read the column and progress of our organization know who has been responsible for our improved Transactions, Newsletter, National Conferences, and various services we are providing. One final note to all of you in the general membership. I would like to encourage you all to become active participants in all of our activities, and I am positive that any of your activities for the organization will be more than repaid, as it has been in my case, back to you in benefits received.

I hope to see you all at our annual conferences, and industry functions, and I am looking forward to the continued growth of our organization.

SAM LANE

## REPORT TO THE MEMBERSHIP

The "final" 1978 budget has been approved by the Technical Activities Board. The following figures and data for VTS are extracted from the Finance Committee Report.

Income Item	Amount	Percent of Total
Membership Fees	\$ 21,700	21%
IEEE Support & Miscellaneous	20,800	20
Publications Sales	29,700	28
Meetings Receipts	32,300	31
<b>Total</b>	<b>\$104,500</b>	<b>100%</b>

Expense Item	Amount	Percent of Total
Transactions & Conference Records Expenses, Printing, Indexing, Editorial Production, etc.	\$ 51,500	57%
Newsletter	7,800	9
Meetings & Miscellaneous	9,900	11
HQ Charges	20,800	23
<b>Total</b>	<b>\$ 90,000</b>	<b>100%</b>

In my report to you last year, I incorrectly stated the amount received from the Automotive Electronics Conference, "Convergence '76". The correct amount for meeting receipts was \$27,000 rather than \$17,000. Of this amount, \$25,000 was from "Convergence".

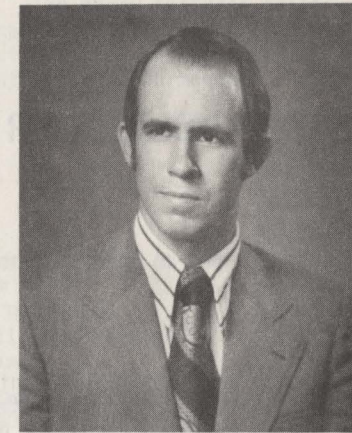
Assuming this coming year goes as budgeted, we will show a surplus for the year of about \$14,500.

ROGER MADDEN  
Treasurer, VTS

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## EDITOR'S NOTES



In this first Newsletter of the new year, the dominate coverage is devoted to the upcoming 28th Annual VTS Conference in Denver, Colorado. All indications point to an exciting event at an exciting location. Perhaps the most impressive aspect of this conference is the number of technical papers that will be presented—over ninety papers, and this count doesn't include any of the papers or seminars sponsored by other organizations. Thanks to the efforts of Winston Scott, you will find brief abstracts on each of these papers in this issue.

In addition to the conference coverage, this issue contains the regular feature articles from members of the Newsletter staff.

That's it for now. Please note the deadline for the May issue.

Olin Giles

### VTS NEWSLETTER DEADLINE

Month of Issue	Final Copy To Be Rec'd. By Editor*	Target Mailing Date
May	4-3-78	5-5-78
August	6-26-78	8-4-78
November	10-2-78	11-8-78
February	1-8-79	2-9-79

\* Inputs for newsletter staff editors should be received 1-2 weeks before these dates.

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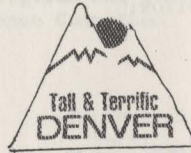


TECHNOLOGY  
ON THE  
MOVE

# 28th IEEE VEHICULAR TECHNOLOGY CONFERENCE

MAR. 22 through 24, 1978

DENVER, COLORADO



A year ago you were promised the 78 Conference would be the best ever and the Denver Committee has kept their word. The 78 Conference has now grown into the best conference ever and a large portion of what has now become Land Mobile Radio and Vehicular Technology Week in Colorado.

At the 78 Conference you will share with over 100 authors exciting new technology, as presented in over 90 technical papers, covering a broad spectrum of vehicular technology with something for everyone. The presentations consist of an exciting trip through the following broad classifications: Automatic vehicle location systems, communications at 450-800-900 MHz., electric vehicles, communications at 800 MHz., electric propulsion and control, automatic vehicle location, communications testing and techniques, automated guideways transit-operational and reliability considerations, recent advances in automotive electronics, guided radio propagation-mines, subways and buildings, personal radio service, automated guideway transit-communications and control, marine systems, regional communications center technology and operation, people movers-past, present and future, communication interference and hazards, propagation, and more.

For those of you wishing to take part in the magic of the microprocessor age, an inexpensive tutorial course is presented on Tuesday, March 21, 1978, which will tell you everything you wanted to know about microprocessors but were afraid to ask.

Land Mobile Radio and Vehicular Technology Week in Colorado has attracted notable personalities, such as William P. Lear, to speak for you at the luncheons and dinner. This exciting week has attracted many related activities some of which are as follows:

National Business Radio Dealers  
Conference, March 20-22 (M, Tu, W)

IEEE Vehicular Technology Society  
Conference, March 22-24 (W, Th, F)

IEEE Microwave Mobile Symposium  
March 21 (Tu)

IEEE Microprocessor Tutorial Course  
March 21 (Tu)

Radio Club of America and IEEE Denver Section  
Banquet, March 22 (W)

Colorado Council of Amateur Radio Clubs  
March 23 (Th)

Land Mobile Communication Council

National Association of Business and Educational  
Radio

Senior Communication Symposium  
NABER, March 21 (Tu)

IEEE Electromagnetic Compatibility Group  
March 22 (W)

Forest Industries Telecommunications  
March 22 (W)

Manufacturer's Radio Service Advisory Committee  
March 22 (W)

Plus Others

There is so much to share with you during Land  
Mobile Radio and Vehicular Technology Week in  
Colorado that you cannot afford to miss.

For advance programs contact:

John F. Shafer  
U.S. Department of Commerce  
National Bureau of Standards  
Boulder, Colorado 80302  
(303) 499-1000 ext. 3724

Exhibitors contact:

Herb W. Bass Associates  
310 Seminole Drive  
Boulder, Colorado 80303  
(303) 499-7509

Conference Registration:

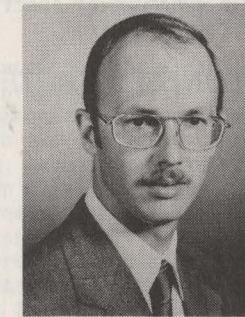
IEEE VTS '78  
P.O. Box 17154  
Denver, Colorado 80217  
(303) 377-2004 or 233-6216

## ABSTRACTS OF TECHNICAL PAPERS WEDNESDAY MORNING ACTIVITIES

Session: AUTOMATIC VEHICLE  
LOCATION SYSTEMS

Session: Walter Scales  
Chairman: MITRE Corp.

Time: Wednesday Morning  
9:30 to 12:00 Noon



Automatic Vehicle Location System Selection

Geoffrey D. Wilson  
The Aerospace Corporation

When employed in police operations, an automatic vehicle location system becomes one element of the overall police system. The characteristics of such overall operations, the planned uses for the location system and even the city layout and topography influence system parameters and must be afforded consideration in the selection process. This paper describes the relationships between operational requirements and system performance parameters and identifies the technical and administrative factors that should be considered in the selection and deployment of cost-effective automatic vehicle location systems.

\* \* \* \*

An Integrated Approach to Automatic Vehicle Monitoring and Mobile Digital Communications

A. Borelli and S. Sklar  
Hazeltine Corporation

This paper presents a description of an integrated system operating in the 900 MHz band which accomplishes (1) automatic vehicle location and status reporting (AVM) and (2) two-way mobile digital communications (MDC) in support of vehicle fleet command and control.

\* \* \* \*

Analysis of Test Data from an Automatic Vehicle Monitoring (AVM) Test

John S. Ludwick, Jr.  
The METREK Division of the MITRE Corporation

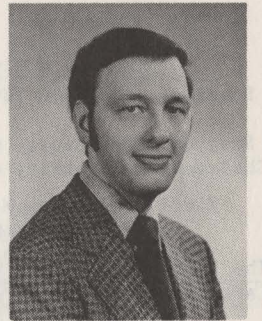
Automatic Vehicle Monitoring systems provide to a central control point the locations of members of a fleet of vehicles. A recent series of tests has been held in Philadelphia for four improved location systems. The basic technologies represented were: VHF signpost, microwave signpost, pulse trilateration and Loran C. This paper analyzes the test results obtained from these technologies.

\* \* \* \*

Comparative Analysis of Six Commercially Available AVL Systems

E. N. Skomal  
Aerospace Corporation

Results of experimental and theoretical comparisons of six commercially available AVL systems are presented and discussed. The study included positioning accuracy, communication links, central computer requirements, and environmental factors such as road conditions which influence performance.



Session: COMMUNICATIONS AT 800  
MHZ

Session: W. H. Chriss  
Chairman: Bell Laboratories,  
Holmdel

Time: Wednesday Morning  
9:30 to 12:00 Noon

A Comparison between the Energy Deposition in Portable Radio Operators at 900 MHz and 450 MHz

Q. Balzano, O. Garay, R. F. Steel  
Motorola Inc.

In this paper, the results of an experimental investigation on the power deposition into "phantom" operators of portable transmitters at 800-900 MHz are compared with the results of previous work at 450 MHz, a traditional portable communication band.

\* \* \* \*

Mobile Telephone Control Unit Design Objectives for the High Capacity Mobile Telecommunications Systems

J. Thomas Walker  
Bell Laboratories

The control unit provides people in a moving vehicle with access to mobile telecommunications service in much the same manner that the telephone station set serves people in homes and offices. In establishing design objectives for the HCMTS control unit physical design and calling procedures, two considerations are discussed which have not been encountered in our land-line telephone experience.

\* \* \* \*

Human Factors Evaluation of Calling Procedures for the High Capacity Mobile Telecommunications System

B. L. Hanson and C. E. Broneil  
Bell Laboratories

The Bell System's High Capacity Mobile Telecommunication System design results in some major departures from present telephone service in the mode of user operation. This paper describes the system and experimental program designed to select the most usable call placing procedure, the least ambiguous button labels, and to explore problems of mobile system usage in general.

\* \* \* \*

The Chicago Developmental Cellular System

J. T. Kennedy and D. L. Huff  
Bell Telephone Laboratories

The Federal Communication Commission has authorized Illinois Bell Telephone (IBT) to construct and

operate a Developmental High Capacity Mobile Telecommunications System (HCMTS) in the Chicago area. This paper will describe the system, the prerequisite activities to the two major system test phases, and the status of activities as of November, 1977.



Session: ELECTRIC VEHICLES

Session Chairman: Dr. George Gless  
University of Colorado  
Time: Wednesday Morning  
9:30 to 12:00 Noon

The Electric Phoenix, an Illustrated History of Electric Cars, Motors, Controllers, and Batteries

Ernest H. Wakefield  
Linear Alpha Inc.

The author reviews the historical development of electric vehicles with many interesting anecdotes. For example, did you know that for awhile, the world speed record was held by an electric automobile (57 mph in 1900)? Recent developments of interest to the electric vehicle industry are also described.

\* \* \* \*

Electric Vehicles in Bell System Use

John MacDougall  
AT and T

Electric vehicles have been suggested many times to the Bell System as a means of reducing cost through lower energy and repair costs. Several vehicles are being tried to test feasibility. The first part of the trial indicates that some use of electric vehicles is feasible and probably economical. The small post office vehicle will only fulfill the lowest portion of the needs. A larger vehicle is needed for more satisfactory service, it is concluded.

\* \* \* \*

Microprocessor Control of an Electric Vehicle

W. D. Wesson, F. W. Colliver, L. L. Grigsby  
Wesson & Associates, Inc.

This paper describes the use of a microprocessor to control the operation of a d-c series motor that is used to drive a battery-powered van. The microprocessor provides control by sampling the speed of the vehicle and comparing this speed to the desired speed, which is set by the operator, and then vary the duty cycle of the SCR chopper based on the computed speed error to maintain the vehicle at the desired speed.

\* \* \* \*

Alternator Energized Electric Towing Dynamometer

T. O. Jones, H. D. Stewart, D. E. Wilson  
General Motors Proving Grounds

The national move toward smaller and lighter weight, fuel efficient vehicles resulted in demands for smaller and compatible instrumentation. Previously

designed dynamometers for regular-sized vehicles were unable to provide adequately low drawbar levels for small cars like the Chevette. This report describes electrical and mechanical characteristics and operation of a dynamometer specifically designed for contemporary vehicles.

**WEDNESDAY AFTERNOON ACTIVITIES**



Session: COMMUNICATIONS AT 800 MHz  
Session Chairman: W. H. Chriss  
Bell Laboratories, Holmdel  
Time: Wednesday Afternoon  
1:30 to 5:00 p.m.

Frequency Synthesis in V.H.F. Mobile Radio

James M. Bryant  
Plessey Semiconductors

This paper discusses various aspects of the design of frequency synthesizers at V.H.F. and U.H.F. frequencies for use in mobile radio systems. Topics covered include the use of Surface Acoustic Wave (S.A.W.) oscillators to achieve exceptional short term stability, and the relative merits of various methods of frequency reduction prior to the programmable divider in the synthesiser.

\* \* \* \*

New Type of Band-Pass Filters for Mobile Radio Communication Units

M. Makimoto, S. Yamashita, K. Suzuki  
Matsushita Research Institute Tokyo, Inc.  
Matsushita Communication Industrial Co., Ltd.

Japan has experienced increased market demands for mobile radio communication units that have small size, high performance, and high quality. This paper describes a new type of band-pass filter of small size which is an important component in the RF modules of 900 MHz communication units. The filter is more compact than conventional capacitor-loaded resonators. The filter's excellent performance is described in the paper.

\* \* \* \*

A Receiver Feasibility Study for the Spread Spectrum High Capacity Mobile Radio System

D. P. Grybos and G. R. Cooper  
Purdue University

Considerable theoretical work has been done on the application of spread spectrum techniques to high capacity cellular mobile radio systems. This theoretical work assumes a receiver structure that is mathematically convenient and does not address the problem of implementing such a receiver. The study examines a number of possible configurations and modifications of the mathematical model with respect to the feasibility of their physical implementation with advanced and state-of-the-art components.

\* \* \* \*

Analytical Models in Monitoring Mobile Packet Radio Devices

Daniel Minoli and Israel Gitman  
Network Analysis Corp.

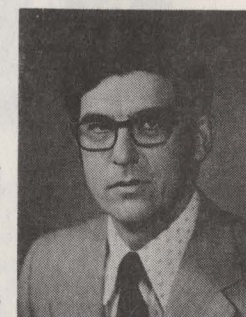
Once a Mobile Packet Radio Network is initialized with the pertinent connectivity information, it is necessary to monitor the performance of the system. Such monitoring is divided into two categories:  
1. Traffic control monitoring; necessary to insure that the system does not become overloaded and experience an appreciable decrease in throughput.  
2. Connectivity control; necessary to insure that every repeater in range is correctly labeled and thus able to communicate with the station.  
In this note we concentrate on the latter type of monitoring.

\* \* \* \*

On Connectivity in Mobile Packet Radio Networks

Israel Gitman and Daniel Minoli  
Network Analysis Corp.

This paper describes the functional usage of Packet Radio Networks (PRNET) and Mobile Packet Radio Networks (MPRNET). Also presented is a method for computing connectivity as a function of time. Other methods presented are general; however, they have particular significance for predictable mobile PRNET's (station knows the trajectories of repeaters).



Session: ELECTRIC PROPULSION AND CONTROL  
Session Chairman: Frank P. Caiati  
General Motors  
Time: Wednesday Afternoon  
1:00 to 5:00 p.m.

The Power Wheel--Electromotive Torque for Vehicular Applications

Gary S. Goldman  
Goldline Engineering Consultants

The Power Wheel is a compact, self-contained motor in a wheel so that an electromotive torque drive is established. The motor includes a microprogrammed controller and dual-functioning brushless commutation/polyphase rectification circuitry which are also contained entirely within the wheel. A brief discussion of the design, methodology, and operating principles is presented.

\* \* \* \*

The Evolution of a Linear Induction Motor People Mover System

William Watkins and Mel Black  
WED Enterprises, Walt Disney Productions

In July 1975 the WEDway PeopleMover system was introduced to the Tomorrow-Land section of the Walt Disney World Theme Park culminating the development of a transportation concept. A first generation WEDway

PeopleMover system at Disneyland employed track mounted drive wheels acting on a traction surface on the bottom of each car. The second generation system at Walt Disney World, after extensive testing of linear synchronous motors, was ultimately fitted with linear induction motors.

\* \* \* \*

Inductive Power Coupling for an Electric Highway System

J. G. Bolger, F. A. Kirsten  
Lawrence Berkeley Labs

An electric highway system in which power can be continuously supplied to a moving vehicle is under development. This system can provide extended range and improved performance to electric vehicles of many types, such as electric trucks and buses as well as automobiles. The system is based on a unique inductively coupled power transfer mechanism, which is explained in the paper.

\* \* \* \*

Design Study for a Flywheel-Electric Car

W. M. Brobeck  
W. M. Brobeck and Associates

The paper describes the design of a flywheel-generator unit and its application to a vehicle. The flywheel is of fiber-composite material, supported on magnetic bearings and directly coupled to an inductor-type generator. The moving part runs in high vacuum in an enclosure mounted on gimbals. An arrangement of the equipment in the car will be shown with the results of calculations of weight, efficiency, and performance.

\* \* \* \*

Obstacle Protection with Unmanned Vehicles

R. W. Houskamp  
Lear Siegler, Inc./Automated Systems Division

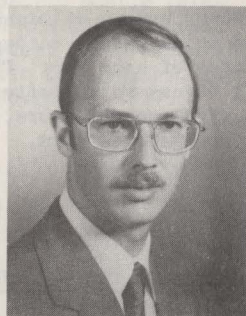
The use of electric powered vehicles is slowly expanding out from the industrial workplace into offices, hospitals and "clean" manufacturing areas. Because most of the using personnel are not familiar with automated vehicles, special safety precautions must be included in the vehicle. This paper describes a reliable control system which is unaffected by external interference from radio stations, electric typewriters, computers, and other equipment.

\* \* \* \*

Regeneration in Electric Vehicles

R. H. Miller, J. J. Brockman, Alexander Kusko  
BART and A. Kusko Inc.

Regeneration in electric vehicles has been promoted for energy recovery, reduced wear on mechanical brakes, reduced heating of on-board braking resistors, and increased range of energy-storage vehicles. This paper reviews the purposes, methods, and advantages of regeneration for such electric vehicles as locomotives, multiple-unit cars, subway cars, light-rail vehicles, PRTs, and energy-storage vehicles.



Session: AUTOMATIC VEHICLE LOCATION

Chairman: MITRE Corp.

Time: Wednesday Afternoon 1:30 to 5:00 p.m.

Loran C Tracking of Land Vehicles using Microcomputers

A. A. El-Sawy, J. W. Feuerstein, R. P. Mayer  
MITRE Corp.

The concept, design, test, and evaluation of two similar Loran C land vehicle tracking systems are presented. One system was developed to provide field demonstrations of applications of Loran C location techniques. The second system was configured for the Philadelphia Health Management Corporation to automatically display the reported status and location of two emergency medical service (EMS) vehicles to aid in more efficient ambulance dispatch and control functions. All system controls and calculations are provided by a microcomputer.

\* \* \* \*

The Huntington Beach Automatic Vehicle Monitoring System Utilizing Overlapping RF Signposts

George W. Gruver  
Hoffman Information Systems

In the 1975 VTG Conference in Toronto, the author reported on an economical direct proximity approach to AVM utilizing overlapping RF signposts. Vehicle location was determined, in each vehicle, through simple processing of the signal strengths and binary codes received from pairs of adjacent signposts separated by 800 to 1500 feet. This paper describes the system which has been operating for over a year in Huntington Beach, California.

\* \* \* \*

An Experimental System for Processing Vehicle Movement Information

Toshihiro Tsumura  
University of Osaka, Japan

This paper presents a proposed experimental system for processing movement information of a vehicle. Using a self-contained on-line computing processor which computes position and bearing angle (heading), the trajectory of the location of the vehicle has been successfully displayed.

\* \* \* \*

Dead Reckoning Vehicle Location using a Solid State Rate Gyro

M. D. Kotzin and A. P. van den Heuvel  
Motorola Inc.

Automatic vehicle location is an area of continuing study at a number of laboratories. Among the various methods being considered is dead reckoning using continuous vehicle heading information in conjunction with

odometer data to provide regular updates of estimated vehicle position. This paper describes the design and experimental evaluation of one such method employing a solid state rate gyro as the heading sensor.

\* \* \*

Philadelphia Field Tests of an Overlapping Signpost AVM System during the UMTA Multi-User AVM Program

George W. Gruver  
Hoffman Information Systems

A comprehensive field test and evaluation in Philadelphia, Pa., of an electronic signpost AVM System is described. The system tested is a direct proximity RF signpost system utilizing overlapping signposts operating at 49.86 MHz. An objective of the program is the selection of an AVM location technology for implementation in the Southern California Rapid Transit District and its evaluation as a Multi-User AVM System in the Los Angeles area.

**WEDNESDAY EVENING ACTIVITIES**

RADIO CLUB OF AMERICA & IEEE DENVER SECTION BANQUET



Fred M. Link is President of the Radio Club of America, and a Fellow of IEEE. He is recognized as the father of landmobile radio. In 1931, he founded the Link Radio Corporation which soon produced sophisticated FM vehicular equipment utilizing the spectrum with maximum communication effectiveness. Link's pioneering of FM in public safety communications resulted in a broad range of communication equipment for the armed services during World War II. Link Radio in later years pioneered the first 450 MHz UHF equipment used in a broad variety of services. He has received many awards for significant contributions in military, public safety, international and common carrier two-way radio communication.



RECEPTION  
6:00 p.m.

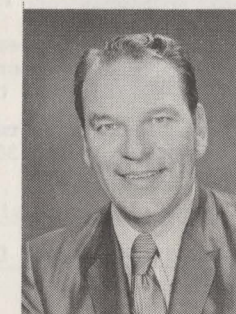
DINNER  
7:00 p.m.

EVENING  
SPEAKER

William P. Lear is a Fellow and former Director of the Radio Club of America and a Fellow of the IEEE. He is a prolific inventor and innovator. He made important contributions in automatic direction finders and automatic aircraft landing systems. He developed the eight-track tape cartridge and was an early pioneer in cartridge audio recorders. As an aviation engineer, his

role with Lear Jet is well known. He has received many honors and awards from his significant contributions in many fields.

**THURSDAY MORNING ACTIVITIES**



Session: COMMUNICATIONS TESTING AND TECHNIQUES

Chairman: National Bureau of Standards

Time: Thursday Morning 9:00 to 12:00 Noon

Communications Security Devices (CSD)--Techniques, Constraints, and Selection

Arnold M. McCalmont  
TCC

A number of advanced and fairly sophisticated communications security techniques are briefly described and depicted by use of audio tapes, sonograms, and text. A discussion then follows of the various constraints and considerations affecting the proper use of CSDs in different types of communications systems.

\* \* \* \*

Selective Signalling for Portable Applications

Leonard E. Nelson  
Motorola Inc.

In the selection of a selective signalling technique for use in portable systems, consideration must be given to code capacity, speed, reliability, sensitivity, false alarm rate, flexibility, and system maintenance. One technique, multiple sequential tone signalling, has been used extensively; however, this technique does not provide the flexibility and low system maintenance provided by binary signalling approaches. In this paper, the characteristics of binary codes necessary to meet the stringent requirements of the portable environment are explored.

\* \* \* \*

15-KHz Channel Spacing Tests in the 150-MHz Band IMTS

R. A. Christie  
Bell Laboratories

Tests were conducted in Portland, Oregon to establish the adequacy of techniques developed to permit collocated operation at 15-KHz channel spacing in the 150-MHz band of the Domestic Public Land Mobile Telephone Service. This paper gives the conditions, procedures and results for these tests, and concludes that collocated operation at 15-KHz channel spacing in the 150-MHz band is practical and requires only minor changes to existing equipment and procedures.

\* \* \* \*

"What About the Customer?", a Survey of Mobile Vehicle Telephone Users

V. J. Smith  
Bell Laboratories

To determine the characteristics of mobile telephone users, a mailed questionnaire survey of Bell System mobile telephone customers was conducted. The questionnaire was divided into several topic areas. Results of the survey, and its implications, will be discussed.

\* \* \* \*

Adaptive Signal Processing in the Coastal Harbor Radio-Telephone System

C. W. Schaible  
Bell Laboratories

This paper describes methods by which land-based receivers in the Coastal Harbor radiotelephone system can reliably detect and process A3A signals in the two-to-three megahertz frequency range. These methods have been implemented in the Coastal Harbor radiotelephone system in Boston. Test results indicate that the receivers are able to operate reliably in the non-stationary noise and signal environment.

\* \* \* \*

Testing the Electronic Industries Association Land Mobile Antenna Gain Standards at the NBS

H. E. Taggart and J. F. Shafer  
National Bureau of Standards

The Electronic Industries Association has a published standard, EIA RS-329A, Minimum Standards for Land-Mobile Communications Antennas. This standard details the minimum performance requirements, test methods, and standard antennas for evaluating the performance of fixed and base station antennas at frequencies from 25 to 1000 MHz. The National Bureau of Standards calibrated some of these antenna standards. Two antennas were calibrated in the 450-512 MHz band and two in the 800-900 MHz band. This paper describes in detail the measurement techniques used in the program, the measurement results, and uncertainties.

\* \* \* \*

County Emergency Medical Communications in a High Density Urban Area with Dynamic Frequency Assignments

W. W. Beaman, H. K. Spence, R. Flanagan, G. E. Austin  
County of San Mateo, California

The County of San Mateo, California, in cooperation with the Communications Division, has purchased and installed a County-wide Communications System, for the purpose of allowing those personnel responding to an emergency medical need to cooperate fully and quickly to that need. This paper explores the standard operating procedures and current operations of the system.



Session: AUTOMATED GUIDEWAYS TRANSIT - OPERATIONAL AND RELIABILITY CONSIDERATIONS

Chairman: Urban Mass Transit Administration

Time: Thursday Morning 9:00 to 12:00 Noon

Fred J. Rutyna  
U.S. Transportation Systems Center

This paper describes a set of computer models being developed to support the development and operational analysis of AGT Systems. Three analytic models, feeder, cost, and availability; and four simulation models, system planning, network discrete event, detailed station, and dertiled operational control, are discussed. All models are executed with similar procedures, share common data files, and provide extensive performance measures for AGT design analysis.

\* \* \* \*

AGT Operating Experience at Morgantown and EXPO '75 Okinawa - A Report from the Field

R. M. Hacker and W. D. Osmer  
Automated Transportation Systems  
Boeing Aerospace Company

The two systems are briefly described in terms of their layouts, functional characteristics, and technical development. The operating histories of the two systems including operating statistics such as passengers carried, and mileage accumulated are discussed. Availability and reliability data for both systems are presented. This data includes availability histories, downtime duration distributions, mean time between failures and mean time to recover. A summary of the significant lessons learned from the operation of the two systems in a public environment concludes the discussion.

\* \* \* \*

The Reliability History of Airtrans

C. W. Watt D. M. Elliott  
U. S. Trans. Systems Center Dallas-Ft. Worth Airport

The automated AIRTRANS system, purchased by the Dallas/Ft. Worth Airport Board from the Vought Corp., went into revenue service on the day the giant new airport opened in January, 1974. Since that day, it has served as a generally convenient and rapid connector between the airport's widely spaced passenger and employee stations. This paper summarizes the performance of the system to date.

\* \* \* \*

Station Design Impact on Reliability Assessment

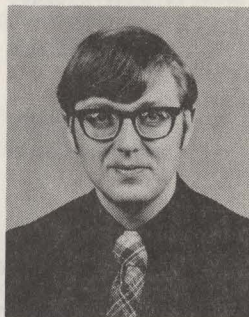
Eugene Bagenstos  
TWR/Colorado Electronics

This study describes a methodology that can be used in evaluating a transit system, placing emphasis upon station configuration and establishing maneuver zones for vehicular interaction. Station areas are described from interrelation with the guideway and operational policies. In order to determine quantity of vehicles in a given section at a specified time, the operational procedures are also examined.

Session: RECENT ADVANCES IN  
AUTOMOTIVE ELECTRONICS-  
PART 1

Session Dr. John Cassidy  
Chairman: General Motors  
Technical Center

Time: Thursday Morning  
9:30 to 11:30 a.m.



A Review of Wheel-Lock Control Systems for Air-Brake Vehicles

T. O. Jones and D. J. Bonvallet  
General Motors Proving Grounds

The stopping distances prescribed in Federal Motor Vehicle Safety Standard 121 require that all wheels on the vehicle develop near-peak retarding force. This paper discusses brake systems which achieve near-peak retarding force at each wheel regardless of load distribution. The electronic control sensors will be described with emphasis on RFI caused wheel lock-up and brake failure problems.

\* \* \* \*

Speed, Acceleration and Pulse Prediction Calculations on Test Vehicles with Wheel Pulse Generators

C. H. Kraft  
Sandia Laboratories

A common method of measuring speed and distance on test land vehicles is through the use of wheel pulse generators. In this paper the basic methods of estimating speed and acceleration values from a wheel pulse system are discussed. Two practical microprocessor systems are also described. The first system measures speed and distance on a railroad car. The second system estimates tire slippage on an automobile during braking on icy roads.

\* \* \* \*

Suppression of Radio Frequency Interference at the Distributor Rotor Gap

W. C. Kuo  
General Motors Research Laboratories

Traditionally, the suppression of Radio Frequency Interference (RFI) caused by the ignition system of a motor vehicle has been achieved either by making the ignition cable an inefficient antenna or by reducing the ac components of the current flowing in the ignition cable. Recently, novel suppression techniques have been applied with success to the design of ignition systems; often only subtle changes of the distributor rotor gap are involved. This paper summarizes a study carried out to identify the important physical mechanisms in modifications to the rotor gap.

Session: GUIDED RADIO PROPAGA-  
TION - MINES, SUBWAYS,  
AND BUILDINGS

Session Robert L. Chufo  
Chairman: U.S. Bureau of Mines

Time: Thursday Morning  
9:00 to 12:00 Noon



The Use of In-Line Repeaters in Leaky Feeder Radio Systems for Coal Mines

David J. R. Martin  
National Coal Board

Leaky feeder techniques are being used increasingly to provide radio communication with men and vehicles in mines and tunnels. A continuing study by the UK National Coal Board has devoted considerable attention to the use of line-powered repeaters in such systems to compensate for line losses as they occur. Several different ways of achieving duplex communication with simple one-way repeaters have been developed or proposed, and these are capable of providing a far more even and reliable performance than was previously possible.

\* \* \* \*

Medium Frequency Mine Communications

Robert L. Chufo  
Bureau of Mines, U.S. Dept. of the Interior

Wireless radio transmission at Medium Frequency is feasible for both personnel and vehicular communications in underground coal mines. This paper describes propagation which occurs via either a coal seam wave-guide mode or electromagnetic coupling into or out of mine wiring, tracks and air lines, or both.

\* \* \* \*

Radio Communication in Subways and Tunnels through Repeater Amplifiers and Leaky Coaxial Cables

R. A. Isberg  
Comsul LTD

This paper is a report of the author's visits to London Transport, the National Coal Board's Mining Research Establishment and the Cadley Hill Coal Mine where single channel radio repeater and leaky feeder systems are used for underground communication. The report also includes results of the author's investigation of on-channel repeater systems in buildings and multi channel repeater systems in subways and tunnels.

\* \* \* \*

Passive Reflectors as a Means for Extending UHF Signals Down Intersecting Cross Cuts in Mines or Corridors

R. A. Isberg Robert L. Chufo  
Comsul LTD U. S. Bureau of Mines

Passive reflectors are used extensively for extending microwave communication around obstacles above 2000 mHz and the theory of their design and operation is well documented and understood. During recent 450 mHz propagation tests in a room and pillar limestone mine,

which is approximately one half mile in diameter, it was found that two watt transceivers could communicate satisfactorily down straight drifts (corridors) but the range of communication down intersecting drifts was quite limited.

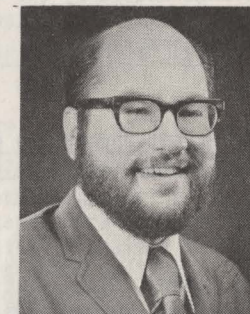
\* \* \* \*

New York World Trade Center--Three Station, Common Antenna--Two-Way Repeater Radio System

Michael J. Caruso and David Geller  
The Port Authority of New York and New Jersey

This paper describes an indoor/outdoor antenna system that serves the World Trade Center's three two-way radio stations, simultaneously, each on different UHF channels. Each station provides; a) base to portable or mobile communications, b) portable to portable repeater operation and, c) one-way paging. The indoor section of the antenna system consists of many branches of leaky type antenna transmission line distributed via carefully selected runs throughout the six subterranean areas each the size of several football fields.

THURSDAY AFTERNOON ACTIVITIES



Session: PERSONAL RADIO SERVICE

Session Dale N. Hatfield  
Chairman: Dept. of Commerce

Time: Thursday Afternoon  
1:30 to 5:30 p.m.

Personal Radio from a Social Perspective

Floyd Shoemaker  
Denver Research Institute  
University of Denver

Citizens band (CB) radio has risen from an obscure hobby to a public mania in the United States in just a few brief years. Much anecdotal evidence exists in the U.S. mass media of the societal impacts of this new technology, but little empirical data are available on the topic. This paper describes a study to develop baseline data to answer important policy-related issues concerning the behavioral and social consequences of the adoption and use of CB radio in the U.S.

\* \* \* \*

Possibilities for Future Personal Radio Services

Ronald Stone and Carlos Roberts  
FCC

The FCC is now in the process of formulating a decision on the future of personal radio services. The Commission's Personal Radio Planning Group (PRPG) has evaluated different scenarios, ranging from maintaining the status quo (leaving the CB radio service as is), to creating new services, possible at VHF or UHF frequencies. This paper describes the PRPG's analyses, scenario evaluation process, and evaluation results.

\* \* \* \*

User Satisfaction and Demand Models for Personal Radio Planning

Ronald Stone  
FCC

This paper discusses user satisfaction and demand projections for the CB Radio Service and for possible new personal radio services at VHF or UHF frequencies. These projections were generated by a computer model developed by the Advanced Research Resources Organization (ARRO) for the FCC's Personal Radio Planning Group (PRPG).

\* \* \* \*

Interference Potential of Personal Radio Services

Mark W. Swartwout  
FCC

One of the major complaints made against the CB Radio Service is the large amount of interference caused to other services or devices. Interference to television, other broadcast receivers, home electronic devices, cable television and land mobile systems was studied. This paper provides an insight into the analysis and presents some of the results. The extent of interference caused by the CB Radio Service as well as the effects of the creation of new services or changes to CB are described.

\* \* \* \*

The Extent and Nature of Television Reception Difficulties Associated with CB Radio Transmissions

John R. Hudak  
FCC

The Federal Communications Commission's (FCC), Field Operations Bureau (FOB) has released the results of a "real-life" study on interference with television reception associated with Citizens Band Radio. The report is based on investigation of a random selection of interference complaints received by six FCC field offices -- Baltimore, Buffalo, Kansas City, Norfolk, San Francisco, and Seattle -- over a one year period.

\* \* \* \*

A Motorist Aid System with Passive Cooperation

S. J. Lipoff  
Arthur D. Little, Inc.

The need and utility of a motorist aid system is presented. The present state of the art of motorist aid systems is reviewed, compared, and critiqued. A novel system concept is presented that resolves many of the difficulties and deficiencies of existing approaches. The new approach requires that inexpensive radio based, digital communication systems be installed on new automobiles.

\* \* \* \*

Urban Congestion and Solar Cycle Effects on CB Radio Range

Leslie A. Berry  
Institute for Telecommunication Sciences

The proliferation of Citizen Band radio has occurred during a period of low solar activity when sky-wave propagation of 27 MHz signals was unlikely. Lucas pointed out that ionospherically propagated interfer-

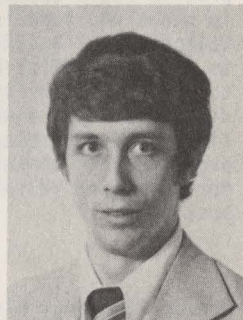
ence might significantly decrease the local range of CB radios near the peak of a solar cycle. On the other hand, increasing local congestion has already decreased this range in urban areas. This paper discusses the combined effects of noise, local co-channel interference, and sky-wave interference on radio range.

\* \* \* \*

SSB for the Citizen Band

A. K. Yesufu  
University of Ibadan, Nigeria

This paper suggests that to make efficient use of available CB spectrum space, a large number of channels will need to be allocated for single-sideband suppressed carrier (SSB). A few channels will be reserved for double-sideband (AM), or compatible single-sideband (CSSB). This paper suggests a modification of a present CSSB system to realize distortionless reception with minimum bandwidth.



Session: AUTOMATED GUIDEWAY  
TRANSIT - COMMUNICATION  
AND CONTROL

Session: Dr. Ronald Rule  
Chairman: Boeing Aerospace Systems

Time: Thursday Afternoon  
1:00 to 5:00 p.m.

Programmable Digital Vehicle Control System

D. B. Freitag and R. P. Land  
Boeing Aerospace Company

The Programmable Digital Vehicle Control System or PDVCS is based upon a microcomputer and is designed to replace the hardwired, discrete components traditionally used in the on-board control of automated rapid transit vehicles. Although designed specifically for the Advanced Group Rapid Transit (AGRT) system under development by The Boeing Company, the PDVCS can easily be adapted for use in any automated transit system.

\* \* \* \*

On the Use of a Microcomputer in a Distributed Transportation System

Jochen Glimm  
Ohio State University

This paper describes the use of a microcomputer to perform vehicle functions of receiving position of the phantom vehicle, measuring and storing intrinsic position of the (real) following vehicle, calculating position error, transforming intrinsic velocity into a required distance, and calculating a controller output signal to excite the vehicle.

\* \* \* \*

Communication System Doubles as a Vehicle Position Transducer

Walter J. Fredericks  
The Otis Elevator Company  
Transportation Technology Division

The Communication link between the wayside and vehicles in an automated guideway transit (AGT) system is utilized to provide incremental position information. The guideway transmission line along with the vehicle antenna modulates (multiplies) the inductively coupled signals (data, voice, and identification) by a function which is related to the longitudinal position of each vehicle. The modulation is detected and processed on the wayside to simultaneously determine the position and velocity of each vehicle. The equations of the modulation and demodulation are discussed along with methods for processing the information.

The development process of the guideway transmission line and electronics is presented. Typical performance parameters and characteristics are given.

\* \* \* \*

A Headway Safety Policy for Automated Highway Operations

Robert E. Fenton  
Ohio State University

Individual-vehicle, automated ground transport is one promising approach towards the solution of transportation problems. The suggested configurations have ranged from captive-vehicle systems for use in a restricted geographical area to dual-mode systems for intra- and/or intercity applications. This paper emphasizes the latter with its many potential advantages.

\* \* \* \*

Stability of the Collision-Proof and Related Braking Laws

Robert M. Storwick  
General Motors Research Laboratories

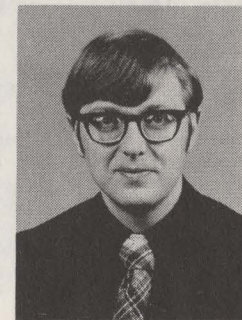
This paper discusses three braking control laws: one is the collision-proof law put forth by Schubring, the other two are modifications of this law. The collision-proof law requires that the kinetic energy of a following vehicle never exceeds that of a leading vehicle by more than the amount which can be dissipated in the distance between them. The other two laws assume, in addition, that there is a finite system time delay, and that there is a time delay which is partially compensated for by projecting velocity measurements ahead in time.

\* \* \* \*

An Unified Approach to Vehicle Follower Longitudinal Control System Design

Brian Pulk and Robert J. Hynes  
Boeing Aerospace Company

The longitudinal control system for a vehicle follower automated transit vehicle has the dual requirements of controlling the vehicle speed and also the spacing between vehicles. Previous attempts at designing these loops individually has resulted in a control system where the two loops are in conflict. An alternative method that is based upon simultaneous loop design with gain scheduling is proposed.



Session: RECENT ADVANCES IN AUTO-MOTIVE ELECTRONICS - PART II

Session: Dr. John Cassidy  
Chairman: General Motors  
Technical Center

Time: Thursday Afternoon  
1:30 to 4:00 p.m.

Microprocessor Transmission Controls

Warren R. Hill  
Eaton Corp.

This paper describes the evolution of electronic controls as applied to a heavy duty truck transmission leading to the present day use of a microprocessor to provide the control function. The control development has paralleled the development of the semiconductor industry, starting with DTL, then TTL, CMOS and now to a microprocessor.

Multifunction Integrated Circuit for Automobile Sensor

Eugene Greenstein and Paul R. Rabe  
General Motors Research Laboratories

A unique and very versatile circuit is described which converts changes in physical parameters such as capacitance, resistance, and inductance into proportional pulse width modulated digital signals. This circuit, in combination with sensors which utilize these physical parameters in their operation, can be used to provide digital inputs to microprocessors and other digital control and diagnostic systems. Advantages of this particular circuit are its potential for high reliability, accuracy, and low cost. Several applications are described and an integrated circuit version of the circuit is discussed.

\* \* \* \*

The EE's Role in the Garage Diagnosis of Vehicle Faults

G. L. Ellery  
Ford Service Research Center

The repair of internal combustion engines and their controls has through the years created an independent electronic equipment support industry. Recently, the requirements of vehicle safety, emission and fuel economy certification by the Federal Government have caused the automotive manufacturers to design electronic test equipment for garage testing of internal combustion engines. This paper describes the intended future efforts of the automotive manufacturers in the areas of test equipment and diagnostic techniques.

\* \* \* \*

Preprocessing Techniques on Computer Simulation of Motorvehicle Crash Victims

B. D. Dimitriadis and P. P. Groumpos  
Florida Technological Univ.

Methods of solution of algebraic equations generated by current computer simulation schemes for motor-vehicle crash victims are reviewed. Preprocessing



techniques, usually found in the literature applied in other areas, are for the first time applied in this problem.

Session: MARINE SYSTEMS

Session: Virgil Rinehart  
Chairman: Office of Advanced  
Ship Operations  
Maritime Administration

Time: Thursday Afternoon  
1:30 to 5:00 p.m.

#### The First Year Operation of MARISAT

David W. Lipke  
COMSAT General Corporation

During 1976, three MARISAT satellites were launched into geostationary orbit over the Atlantic, Pacific and Indian Ocean regions. Commercial communications services were initiated in the summer of 1976 between shore stations located in the United States and a large variety of ocean-going vessels. Over the past year and one-half the use of the MARISAT system has expanded considerably.

This paper reviews briefly the elements of the MARISAT system and presents information on the types of services provided, the classes of ships and off-shore platforms using the system, and the growth in system usage.

\* \* \* \*

#### Simulation of Ship Steering Control for Underway Replenishment (UNREP)

J. G. Dimmick, S. H. Brown, R. Alvestad  
David W. Taylor Naval Ship Research & Development Center

This paper discusses subject areas such as the UNREP simulation, early simulation results, simulated automatic control, quickened steering display, quickened UNREP steering simulation, and sensor requirements.

\* \* \* \*

#### Alaska Tanker Simulation Experiments with New Precise Navigation Displays

Dr. William McIlroy  
U.S. Merchant Marine Academy

In confined and congested harbor areas the need has arisen for an all-weather precise navigation system to process Loran-C information with the minimum of human intervention.

An ideal system was tested on the CAORF real-time simulator, during a series of experiments in Valdez Narrows, Alaska. It proved more effective than an ideal radar system in giving better track keeping performance.

\* \* \* \*

#### Human Factors Simulator Experiments Using a Prototype True Motion Vector Display for LNG Ship Docking

Dr. Justus R. Riek, James J. Johnsen, Elliott Manaker  
U.S. Merchant Marine Academy

A ship handling experiment was conducted at CAORF to study ship docking performance in the presence of varying winds. A new true motion vector PPI display was used as a docking aid to enhance perception of low

speeds. Test subject acceptance of the display was enthusiastic. The experiment offers evidence that such pictorial information may be more useful than existing docking aids.

\* \* \* \*

#### Optimized Location for Navigation Transponders

Joseph J. Fee  
MITRE Corp.

A procedure for determining the optimum sites for the fixed elements of a surface navigation system, subject to constraints upon allowable locations, is derived. The procedure is then implemented as a computer algorithm for a simplified range measurement system and several numerical examples of site optimization in the presence of constraints are treated.

### FRIDAY MORNING ACTIVITIES

Session: REGIONAL COMMUNICATIONS  
CENTER TECHNOLOGY AND  
OPERATION

Session: Dr. W. D. McCaa, Jr.  
Chairman: Boulder Regional Com-  
munication Center

Time: Friday Morning  
9:00 to 12:00 Noon

#### San Francisco Bay Area Communications Plan and Implementation for Coordination of UHF MED Channels among Nine Counties

W. W. Beaman and G. E. Austin  
County of San Mateo, California

Operation of a region-wide Emergency Medical Communication System requires the coordinated sharing of the eight available UHF radio channels, authorized by the FCC for voice and telemetry use. An "EMS" coordinated plan has been agreed upon. However, a number of different operational and technical problems are inherent. This paper will elaborate on these, and on the success to date of the Bay Area regional system.

\* \* \* \*

#### An Integrated Municipal Command, Control and Communication System

L. L. Taylor  
Bernard Johnson Inc.

Improved system functional operation and economy of system design, implementation and operation can be realized by a municipality if a systems engineering approach is used to develop one system to provide multiple functions for the municipality. The City of Jackson, Mississippi chose to take such an approach. This paper describes the project and the resultant system design by detailing system engineering steps which were used to develop the system.

\* \* \* \*

#### Iowa Public Safety Mobile Communications System

Gerald Graves  
State of Iowa

This paper describes in detail the technical and operational aspects of the Iowa Public Safety Mobile Communications System. The mobile communications system is unique in design and applies many technological advances to land mobile applications.

\* \* \* \*

#### Simo-Transmit Systems - A Solution to Wide Area Coverage

Gary Cannalte  
Motorola Inc.

A small but significant number of simulcast systems now exist and have been operational for some time. While the basic concept is not really new, the applications of it are. System designers were faced with a promising technique which was backed by some promising theory, but very little proven performance. Therefore, the first system designs were understandably both cautious and conservative. Through experience gained from these existing systems, larger, higher performance and more sophisticated systems are now being made operational. Caution and care have not been abandoned, but rather are now focused in the now better known and understood problem areas. These areas have been distilled to a point where they can be categorized and predicted with reasonable certainty. Of equal importance some anticipated problems failed to materialize as problems and actually turned out to be blessings in disguise.

\* \* \* \*

#### Computer Controlled, Solid State Audio Switching System

Gregory E. Austin  
County of San Mateo, California

An audio level (0 dBm), multiline matrix switching system was designed and built to provide the function of interconnecting two simultaneous users of a radio circuit on a demand basis. A brief description of the technical and operating details of the EMS switching matrices will be given as well as performance of the system to date.

\* \* \* \*

#### Constraints upon the Development of the Nationwide High Capacity Land Mobile Radio System

R. P. Eckert and P. M. Kelly  
Kelly Scientific Corp.

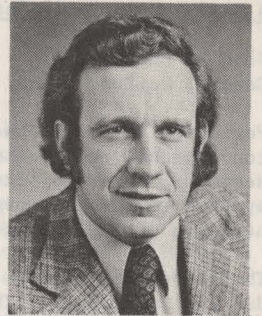
The constraints upon the development of the nationwide high capacity land mobile radio system encompass considerations of national policy, regulatory requirements, economics, and technology. Those constraints considered to be of priority importance are presented and evaluated. The material presented is considered to be essential for planning for system realization.

\* \* \* \*

#### Low Cost Satellite Land Mobile Service for Nationwide Applications

J. A. Weiss  
Fairchild Space & Electronics Co.

A satellite land mobile system using mobile radios in the UHF band, and Ku-band "Communications Routing Terminals" (earth stations) for a nationwide connection from any mobile location to any fixed or mobile location, and from any fixed location to any mobile location is proposed. The technical features and advantages of such a system are discussed.



Session: PEOPLE MOVERS - PAST,  
PRESENT AND FUTURE

Session: T. P. Merrick  
Chairman: Westinghouse Electric  
Corp.

Time: Friday Morning  
8:30 to 12:00 Noon

#### Atlanta Airport People Mover - The Fifth Generation System by Westinghouse

Thomas C. Selis  
Westinghouse Electric Corporation

The Atlanta Hartsfield International Airport is the second busiest airport in the world second only to Chicago's O-Hare. This year a projected 15 million passengers will flow through the Atlanta Terminal. This figure is expected to double by the year 1990.

For the past ten years planners have been attempting to come up with a functional design that would handle the projected passenger flow through the year 2000. The design finally selected employs the use of a People Mover System which will carry passengers between the terminal and four concourses.

The People Mover System is the fifth generation system built by Westinghouse. Westinghouse has deployed People Mover Systems in Tampa, Seattle, and Busch Gardens in Williamsburg, Virginia. Another system will go into operation at Miami International Airport late in 1978. The Atlanta Airport People Mover System will begin operation in mid-1980.

The People Mover System will utilize new technological advancements recently developed for the Westinghouse system. These are the use of a new switch design, a new power rail system and use of microprocessors to control the operation of the Vehicle System. The system will provide a service availability of greater than 99%.

The People Mover System will provide continuous passenger service and will consist of six trains of up to four cars each. The trains will circulate over 12,000 feet of guideway in a tunnel designed for that purpose. Thirteen transit switches will be used to facilitate a reverse turnback movement and provide for redundant operational modes in cases of failures. The system will operate on headways of less than 100 seconds.

The paper will describe the Atlanta People Mover System with emphasis on the new technological advances made by Westinghouse.

\* \* \* \*

#### Morgantown System Overview

Dale G. Shellhorn  
Boeing Aerospace Company

The initial portion of the Morgantown system has been operating in passenger service since September 1975. This paper defines the extensions necessary to complete the Phase II system, and relates the problems observed in operations to design changes that will be incorporated in Phase II. A brief program history, system element description, and operational scenario is included for continuity.

A Rail People Mover Headway Comparison

John H. Auer, Jr.  
General Railway Signal Company

For many years, GRS has supplied control systems for conventional rail transit, with headways as low as 75 seconds. Recently, the company has supplied control systems for people-mover applications in which minimum headways of 10 to 20 seconds have been achieved.

There are many factors contributing to this large reduction in headway. These factors are identified, evaluated and discussed from the viewpoint of potential for increased capacity of rail transit.

\* \* \* \*

Computer Simulation Study on City Car System

M. Abe, K. Suzuki, F. Harashima, S. Kariya  
Jizai Engineering, Ltd., Japan

The system we call the City Car System is an effective and efficient public car use system in a city composed of small-sized cars, stations, and a centralized managing computer. The stations are built at key points in a city, and small cars are distributed appropriately to each station. A passenger in the city is able to drive the car from a station to another nearest to his destination.



Session: COMMUNICATION INTER-FERENCE AND HAZARDS  
Session: Ezra B. Larsen  
Chairman: National Bureau of Standards  
Time: Friday Morning  
9:00 to 12:00 Noon

Analytical Determination of the Interference of Commercial FM Stations with Airborne Communication and Navigation Receivers and Experimental Verifications

J. E. Essman and T. Loos  
Ohio Univ. at Athens

An analytical model of the RF-amplifier stage using a third order nonlinearity of airborne communication and navigation receivers capable of predicting the effects of multiple interfering FM stations is developed. The effects of receiver input filters and IF-filtering are also modeled.

\* \* \* \*

The Future Noise Environment at 800 MHz

J. Stimple, P. Bocci, M. Kotzin, A. P. van den Heuvel  
Motorola Inc.

Due to the relatively low noise environment which currently prevails in the 800 MHz spectrum recently allocated for land mobile radio systems, it is of considerable interest to determine the extent to which this situation is likely to deteriorate as the usage of the band grows. To this end, an extensive series of measurements of both noise level and received signal levels around 450 MHz has been conducted.

The Microwave Power Satellite: What will Happen if Pandora Opens the Joule Box?

Don R. Justesen  
Veterans Administration Hospital

In the wake of dwindling supplies of fossil fuels and of mounting opposition to nuclear energy, the Solar Power Satellite (SPS) is emerging as a seriously considered source of energy. The benefits of a virtually continuous supply of "clean" energy must be assayed against the influence of the microwave beam on the ionosphere, and the potential perturbation of ecological systems by microwave fields. This paper presents a risk-benefit analysis on some of the predicted effects of such an energy system.

\* \* \* \*

The Highway Advisory Radio Service

William S. Halstead  
Telecommunications Consultant

Background information relating to the recent establishment by the Federal Communications Commission (FCC) of a new highway radio service to assist drivers of motor vehicles by use of standard AM radio receivers is reviewed. Problems are examined in the utilization of roadside cables of induction-radio type or small antenna structures with associated low-power radio transmitters in order to limit the effective signaling distance.

\* \* \* \*

National Bureau of Standards Time and Frequency Services

George Kamas  
National Bureau of Standards

Frequency and time signals from the National Bureau of Standards are widely used to calibrate electronic devices, perform navigation experiments such as vehicle location and for setting of digital clocks. This talk will review the presently available NBS services.

The present status of WWV and WWVB will be discussed and new NBS services using television signals and a 468 Mhz satellite will be described. Telephone accessible services for voice and computer time setting will also be included. A recently published NBS Technical Note entitled "Time and Frequency User's Manual" will be made available free to conference attendees.

**FRIDAY AFTERNOON ACTIVITIES**



Session: PROPAGATION  
Session: Donald L. Lucas  
Chairman: Dept. of Commerce  
Time: Friday Afternoon  
1:30 to 5:00 p.m.

A Prediction for the Next Solar Cycle

H. H. Sargent III  
Space Environment Services Center

A number of predictions for the next solar cycle (Cycle 21) are examined and tabulated. It is shown

that published predictions, to date, have been predominately in favor of a low solar cycle (120 or less). The prediction method of Soviet investigator A. I. Ohl is discussed. His method is applied, using one hundred and ten years of sunspot and geomagnetic data to give a forecast for Cycle 21.

\* \* \* \*

Meteor Burst Data Transmission

Harrison Smith  
Secode Electronics

This paper describes an operational system which makes use of short duration ionized meteor trails in the upper atmosphere to reflect or re-radiate VHF data messages between a single central location and multiple remote locations. A current use of the system is to gather meteorological data from numerous remote locations at distances of up to 1200 miles from a central data gathering facility.

\* \* \* \*

Measuring Characteristics of Microwave Mobile Channels

R. W. Hubbard, R. F. Linfield, W. J. Hartman  
Dept. of Commerce, OT/ITS

This report describes the application of a high resolution (6 ns) PN channel probe for evaluating the transmission character of a land-mobile communication channel. Preliminary measurements were performed at a microwave frequency in a number of locations in Boulder, Colorado. Examples of data are presented which characterize the frequency correlation of the channel transfer function, and provide additional information on the spectral distortions caused by multipath.

\* \* \* \*

Evolution of PATSAC Technology

L. J. Lukowski and D. Yost  
GTE Service Corp. and COMPUCON

PATSAC Technology is one of the main techniques that is not applied today by radio engineers when planning new mobile and/or paging system coverage areas. PATSAC is the acronym for "Predicted Actual Terrain Service Area Calculations". PATSAC technology for the 150 MHz and 450 MHz bands will be introduced and the potential application for the 900 MHz band illustrated. We will also show the deficiencies that are inherent in today's calculating methodology if applied to 900 MHz band.

\* \* \* \*

Land Mobile Radio System Performance Model for VHF and Higher Frequencies over Irregular Terrain

Eldon Haakinson and Jean Adams  
U.S. Department of Commerce, OT/ITS

Land mobile communication system designers and engineers often must decide whether to use design-aid models not well suited to the problem of predicting signal attenuation over irregular terrain or to perform many tedious and laborious hand calculations which, coupled with certain "rules of thumb", provide an estimate of system performance. The model documented in this paper provides relief from such problems.

Radio Propagation in Urban Areas

Anita G. Longley  
Dept. of Commerce, OT/ITS

This report reviews much of the earlier work on radio propagation in urban areas, including a good deal of data from measurement programs. A number of investigators have also developed propagation models for use in urban areas. Most of these are largely empirical, and are presented as curves with various correction factors for antenna height, frequency and terrain irregularity.

**MEETINGS**

1978 CARNAHAN CONFERENCE ON

CRIME COUNTERMEASURE

Carnahan House  
Lexington, Kentucky

May 17-19, 1978

\* \* \*

INTERNATIONAL CONFERENCE ON

COMMUNICATIONS

Sheraton Hotel  
Toronto, Ontario, Canada

June 4-7, 1978

\* \* \*

VEHICULAR TECHNOLOGY CONFERENCE

Regency Hotel  
Denver, Colorado

March 22-24 1978

\* \* \*

ELECTRONIC COMPONENTS

Disneyland Hotel  
Anaheim, California

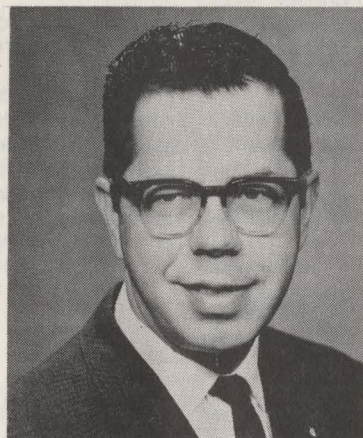
April 24-26, 1978

\* \* \*

OFFSHORE TECHNOLOGY

Houston, Texas  
May 8-11, 1978

## CHAPTER NEWS



Sam McConoughey  
CHAPTER NEWS EDITOR

### CHICAGO

"Performance of Mobile Gain Antennas in a Multipath Environment at 900 MHz"  
by Bill Turney, Senior Engineer, Antenna Systems Research, Motorola, Inc.  
Held at Lancer Steak House, Schaumburg, Ill., on September 27, 1977, with 13 attending.

Mr. Turney explained in detail why mobile gain antennas don't always work. His talk was based on many measurements made on 900 MHz mobile antennas.

"What Every Engineer Should Know . . . . But Probably Doesn't"  
by Roy E. Hofer, Partner, Hume, Clement, Brinks, William & Olds, Ltd.  
Held at Lancer Steak House, Schaumburg, Ill., on November 9, 1977, with 17 attending.  
Mr. Hofer explained that Engineers working individually or for corporations often identify patentable ideas. The legal patent process is frequently foreign to the Engineer. Mr. Hofer identified the "sign posts" of invention, how to keep records, the costs of obtaining a patent, how the U. S. Patent Office processes a patent application, and what to expect if your patent is challenged.

"RF Power Measurements and Techniques for Communications"  
by Paul Cornell, Bird Electronics  
and  
by Daniel Montville, Spectronics, Inc.  
Held on December 19, 1977, with 19 attending.  
A presentation on RF power measurement techniques in tuning up various kinds of antennas was given by these two speakers. A Bird Thruline Wattmeter, donated by Spectronics, Inc., was awarded as a door prize.

### COLUMBUS

"Police, Fire and Emergency Communications"  
by Bob Greer, City of Columbus  
Held on September 14, 1977, with 10 attending.

"Ohio Bell's Mobile Communications"  
by John Carter, Ohio Bell Telephone Co.  
Held on October 12, 1977, with 10 attending.

"Business Meeting"  
Bill Kail, General Electric Co., Chairman presiding.  
Held on November 9, 1977, with six attending.

"WCMH Accucam"  
by Robert K. Dyke, Chief Engineer, WCMH-TV  
Held on December 14, 1977, with 15 attending.

### ORLANDO

"Business Meeting - Plans and Programs for 1977 - 1978 Season"  
John Gilbert, Chairman presiding.  
Held on September 22, 1977, with five attending.

### LOS ANGELES

"The Basis for Automotive EMC"  
by Edwin L. Bronaugh, Southwest Research Institute  
Held on September 15, 1977, with 25 attending.  
A joint meeting with the EMC Group. Mr. Bronaugh discussed past and current programs for determining radiation and susceptibility of automotive electronic systems and provided a summary of currently available data on the subject.

"800 MHz Systems - An Overview"  
by Elliott Lum, Systems Engineering Manager, Motorola, Inc.  
Held on November 15, 1977, with 38 attending.  
Mr. Lum covered the following areas in his overview of 800 MHz systems: FCC Rules and Regulations, 800 MHz propagation, available equipment, site design, and trunked and cellular systems.

### SAN FRANCISCO BAY AREA

"Packet Radio"  
by Ron Kunzelman, Stanford Research Institute  
Held on October 17, 1977, with 14 attending.

"900 MHz"  
by Tom Ulrich, Motorola, Inc.  
Held on November 21, 1977, with 18 attending.

### WASHINGTON, D. C.

"Major Policy Issues Affecting Mobile Communications in the Future"  
by Carlos V. Roberts, Chief, Office of Plans and Policy, Federal Communications Commission  
Held on October 7, 1977, with 38 attending.  
Mr. Roberts discussed the status of planning at the FCC for the Personal Radio Service, spread spectrum techniques, and potential regulatory impacts on mobile services.

"New Technology and Land Mobile Radio"  
by Dr. Charles L. Jackson, Staff Engineer, House Communications Subcommittee  
Held on December 9, 1977, with 70 attending.  
Dr. Jackson discussed the relationships between technological innovation and regulation. New technologies require regulatory changes, he concluded.

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### MORE ELECTION RESULTS

New York	Mr. Hal Blomberg, Chairman (November 1978) 38 Exeter Street Brooklyn, New York 11235 (212) 374-6765
Florida West Coast	Mr. Harry B. Orr, Jr., Chairman (June 1978) 7636 DeSoto Court Tampa, Florida 33615 (813) 224-4291
Miami	Mr. Curtis C. Whitney, Chairman (June 1978) 11000 S.W. 134 Terrace Miami, Florida 33176 (305) 263-3873
Central New England Council (Boston)	Mr. Mark F. Ryer, Chairman (May 1978) 215 Pleasant Street Marshfield, Maine 02050 (617) 567-2001
Denver	Mr. J. F. Shafer, Chairman (June 1978) 941 Teller Circle Boulder, Colorado 80303 (303) 499-1000, Extension 3724
Los Angeles Council	Mr. Thomas N. Rubenstein, Chairman (June 1978) 11380 Harkers Court Cypress, California 90630 (213) 644-1101
Dallas	Mr. C. W. Weaver, Chairman (July 1978) 7107 Mockingbird Lane Dallas, Texas 75214

HELLO - ARE YOU THERE?

Chapters not heard from:

- Central New England Council (Boston)
- Canton
- Cincinnati - Dayton
- Cleveland
- Dallas
- Florida West Coast (Tampa)
- Miami
- Orlando
- Michigan S.E. (Detroit)
- New York
- Philadelphia
- Pittsburgh
- Sacramento
- Toronto
- Vancouver
- Santa Clara Valley (San Jose)

Notes Mail your Meeting Reports to Sam McConoughey at the address shown under "Newsletter Staff," this issue. Some of you are still sending them to John Dettra.

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Still Needed Suggestions for speakers on automotive subjects.

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Need Speakers? In addition to the Speakers Bureau published in the preceding two issues, you may wish to contact some of the speakers that have appeared at other chapters. Contact your C. N. Editor or the chairman of the chapter where he spoke if you need assistance.

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Santa Claus The ADCOM approved an increase in the travel budget for the "Speaker of the Year." Mr. Fred Link is the current "Speaker of the Year." Have you contacted him about appearing on one of this season's programs?

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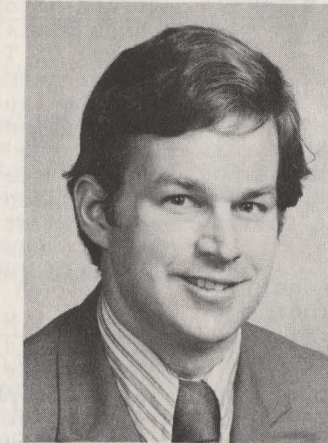
Continuing Education Program In the embryonic stage is a thought to developing a program on Land Mobile Communications. It would be a training seminar developed with the help of the Educational Activities Board and put on locally with the help of the chapters. Shortly we expect to circulate a questionnaire to the membership about this. More on this later.

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Happy New Year! It's 1978, and the Vehicular Technology Group is a thing of the past. We are now the Vehicular Technology Society. Best wishes to all chapter officers and members from your Chapter Chairman and News Editor. May 1978 be our best year ever.

**AUTOMOTIVE ELECTRONICS**

DATELINE: DETROIT



**BILL FLEMING**

**AUTOMOTIVE ELECTRONICS EDITOR**

REACT UPDATE

In the November 1977 issue, I reviewed the activities of REACT, Radio Emergency Associated Citizens Teams. Jerry Reese, Managing Director of REACT, wrote me a letter which included some information to update their current activities.

Jerry reports that REACT has been awarded a Federally funded contract to develop a CB Channel 9 monitor-training program. The object is to train volunteers and public safety personnel to efficiently handle highway emergencies and requests for road information. The program, NEAR (National Emergency Aid Radio) also utilizes state-appropriated Federal Highway Safety funds so that state and local authorities can purchase CB radios. The program aims to develop nationally standardized procedures for coordinating efforts between highway police and volunteer organizations such as REACT.

Jerry noted that REACT dues are \$5 per year, which covers the cost of mailing the publication, REACTer, to the member at his home address.

Jerry also suggested that REACT could assist our Vehicular Technology Group by keeping us updated on news of CB highway safety activities.

PLANS UNDERWAY FOR CONVERGENCE '78,  
THE INTERNATIONAL CONFERENCE ON  
AUTOMOTIVE ELECTRONICS

It is my pleasure to serve on the Convergence '78 conference committee as a representative for IEEE-VTG. This year's conference will be held September 25-27, 1978, at the Hyatt Regency Hotel in Dearborn, Michigan. The general chairman is Mr. Joseph F. Ziomek of Ford Motor Company, who is doing an outstanding job of putting together another quality meeting. This year, the conference is being organized with the help of The Society of Automotive Engineers, and is co-sponsored with IEEE and the Automotive Electronics Committee.

Responding to suggestions on improvement of the Convergence Conference, the Convergence '78 Program Planning Committee has elected to add two sessions covering electronic technology, where papers will emphasize technical detail and will be given by R&D engineers. As usual, however, the core of the Conference program will consist of five sessions, in addition to the two above, covering the status and future of automotive electronics. These core sessions feature invited speakers who will review state-of-the-art and forecast future growth areas. The speakers are always key management engineers, selected to represent all segments of the international automotive electronics industry.

If you wish to be included on the Convergence '78 registration mailing list, send a note to:

Convergence '78 Registration  
c/o Mr. M. J. Asensio, Jr.  
Society of Automotive Engineers, Inc.  
2100 W. Big Beaver Road, Suite 206  
Troy, Michigan 48084

TODAY'S TOPIC

With the introduction of the 1978 models, many new automotive electronics products have been unveiled. For example:

-At Chrysler: The Lean Burn engine control program is expanded, a radio with memory is introduced, and electronic fuel control has been announced.<sup>1</sup>

-At Ford Motor: A miles-to-empty computer display, a closed-loop fuel-mixture control system, and a combined spark-EGR system are introduced.<sup>1</sup>

-At General Motors: Two new engine spark controls, a closed-loop fuel control, an automatic vehicle leveler, a powerful travel guidance computer, and four new radios are introduced.<sup>1</sup>

Some of these new products are described in the November 1977 special issue of IEEE

Spectrum on "The Automobile." It is outside the scope of this article to attempt to review all the 1978 advances, so I decided to concentrate here on radios. In the next Newsletter, I'll describe new automotive electronic systems.

#### CB RADIO: HERE TO STAY

This article follows up on earlier reviews of automotive CB radio (see the August 1976 and August 1977 issues of the VTG Newsletter).

"The public wants more complex entertainment and the automotive marketing and electronics people aim to please. Fancier car radios provide dealers with the CB systems which help them cash in on the craving many drivers have for 'good buddy' mobile conversations".<sup>2</sup> Car companies believe that new integrated systems — custom-designed for particular car models, emphasizing electrical noise suppression, and offering disappearing tri-band AM/FM/CB antennas — will lure a substantial share of new car buyers.

As recently as 1973, some 65 percent of factory installed car radios were limited to AM reception only, but in 1977 the AM market share dropped to less than 40 percent. Don Atwood of GM Delco Electronics forecasts that "by 1980, under 20 percent will be simply AM radios."<sup>2</sup> For example, in 1977, the rate for factory-installed combination CB/AM/FM radios was about 7 to 8 percent, but is expected to reach 15 to 18 percent this year in higher-line GM cars.<sup>2</sup>

I surveyed recent issues of trade journals and found advertisements and stories describing some sixteen new models of automobile radios. A summary of the new 1978 car radios is given in the following (alphabetical) listing of manufacturers.

— A.R.A. Manufacturing, Grand Prairie, Texas, offers a 40-channel, under-dash (and in-dash) CB with one-hand, built-in controls and a digital channel read-out on the microphone which can be stored out of sight beneath the dash.<sup>3</sup>

— ACSA Corporation, Compton, California, offers a 40-channel Module System Transceiver where the radio portion is remotely concealed. It features built-in controls for consecutive up/down channel selection, LED digital channel readout and signal strength indicator lights — all contained in a hand-held microphone.<sup>3</sup>

— Chrysler Corporation, Huntsville Electronics Division, offers a CB/AM radio, a CB/AM/FM, and a search-tune AM/FM stereo radio. The CB radios both are 40-channel units and both allow the user to monitor selected CB channel while listening to AM or FM broadcasts.<sup>2</sup> The search-tune radio contains a microprocessor and a 10-digit keyboard that can be used to choose stations directly by punching in the appropriate carrier frequency. Alternatively, a station can be recalled from the radio's computer memory by a push of a single button. Automatic searching for other stations, at two sensitivity levels, is initiated by a foot

switch, and the station frequency is digitally shown by an LED display.<sup>1</sup>

— Ford Motor Company, Electrical and Electronics Division, offers a 40-channel remote control CB Transceiver, an AM radio with digital clock, and an AM/FM stereo radio with cassette tape player (Fig. 1). The CB unit has an automatic scan feature and it plays through the radio speakers. When the radio has rear stereo speakers, the CB and the entertainment broadcasts can be played simultaneously at different volume levels.<sup>2,3</sup> The CB radio has automatic noise limiting and automatic gain control.

— General Motors Corporation, Delco Electronics Division, offers a deluxe 40-channel CB/AM/FM stereo with integral 8-track tape player, an AM/FM/CB 40-channel monaural radio, a signal seeking and scan AM/FM radio having digital display with in 8-track tape player, and an AM/FM stereo with cassette tape player (Fig. 2).<sup>2,3</sup> The top-of-line CB/AM/FM/8-track stereo (Fig. 3) is integrally packaged and includes a 40-channel CB signal override of the radio and tape functions which returns to entertainment at the completion of the CB conversation. The signal seeking AM/FM/8-track unit (Fig. 4) includes precise electronic frequency selection, plus digital display of station frequency and time. In the scan mode, this radio tunes from one station to the next, sampling each station for 5 to 7 seconds before moving to the next. In the seek mode, the tuner stops at the first signal of pre-set strength. The digital display normally shows time, unless interrupted by the radio frequency display.

— J.I.L. Corporation of America, Inc., Compton, California, offers a computerized 40-channel modular transceiver (Fig. 5) which is a remote control unit working in conjunction with the car radio.<sup>3</sup> The microphone includes a digital LED channel readout and a keyboard-entry channel selector for instant access to any channel at any time. It also includes a scan button to continuously scan all 40 channels, while pausing at in-use channels, and stopping on command. It also automatically searches for, and stops at, clear channels to allow transmission. It writes (memorizes) up to five programmed channels for instant read (recall), and scans only those five if one so desires.

— E.F. Johnson Company, Johnson American, Inc., Clear Lake, Iowa, offers a 40-channel CB transceiver for under-dash mounting.<sup>3</sup> The set features a large digital channel display on the under-dash module, big-speaker sound, and offers a radiotelephone-type handset for private listening. The set is designed for one-hand operation, includes tapered automatic noise limiting with amplified speech compression, and is American made.

— Motorola, Inc., offers a 40-channel CB/AM/FM stereo with 8-track tape player (Fig. 6).<sup>3</sup> The unit is integrally constructed as an in-dash package. Motorola also supplies a remote controlled AM/FM/CB radio to Ford Motor Co.<sup>2</sup>

— Panasonic offers a 40-channel CB/AM/FM stereo radio which is integrally constructed for in-dash installation (Fig. 7).<sup>3</sup> The set

includes a digital LED channel display, an rf signal strength meter, and a standby monitor to receive CB calls while listening to AM or FM.

#### AUTOMOTIVE RADIO: LOOKING AHEAD

The ultimate answer to in-car communications is not CB, but probably will be a radio-telephone cellular system now approved by the FCC.<sup>2,4</sup> This system offers both privacy in communication and long range — two significant advantages over CB. (Nonetheless, CB will probably continue to be a permanent part of the automobile audio world, both for communications and for entertainment.)

Presently, only 47 thousand out of 134 million US vehicles have mobile telephone service.<sup>2</sup> This is primarily because of the high cost of mobile telephones. The cellular concept aims at reducing the cost and broadening the use of mobile telephones. The FCC has approved two demonstrations of the cellular system: one by AT&T and Illinois Bell Telephone in the Chicago area, and one by Motorola and American Radio-Telephone Service in the Baltimore-Washington area.<sup>4</sup> The two systems are compatible with each other.

The cellular systems operate at the FCC's newly approved 800-MHz band. This promises to greatly expand mobile telephone services, now severely congested at 450 MHz and below, to hundreds of thousands of new subscribers by reusing the same frequency channels in different areas, or cells, of each city. Thus the spectrum is to be used more efficiently.

The system allocates a set of frequencies to each cell (geographic area), with neighboring cells assigned to different sets of frequencies to avoid interferences. For cells that are far enough apart, simultaneous use of common frequencies is made possible. The important point is that by reducing transmitted power as well as cell size, the same frequencies can be reused more often, thus utilizing the allocated frequency spectrum much more efficiently.

Both Motorola and AT&T will offer mobile radio-telephones costing about \$1800, but only Motorola is demonstrating a hand-held portable unit. The hand-held unit weighs 2 pounds, fits into a briefcase or purse, will sell for about \$2000, but in its present package is too big to fit comfortably under a car's dashboard.<sup>4</sup> Costs of the new mobile telephones are kept down by reducing the required transmit power of the transceivers under 10 Watts. For example, the portable unit only transmits 1 Watt, but the Motorola system utilizes central cell antennas which are split into six different subsector directions. Each subsector receive direction is sensitive enough to pull in digital and voice signals from a 1-Watt portable transceiver located as far away as 11 miles.<sup>4</sup>

Another necessary condition to permit low-power transmission is that each transceiver will transmit at the minimum of one of four different power levels, as directed by the cell base-station computer.<sup>4</sup> This prevents mobiles and portables close to the antenna from overloading nearby channels, and also reduces co-channel interference between unused frequencies when the mobile units are oriented such that unusually long propagation could occur.

#### REFERENCES

1. Karl E. Ludvigsen, "Electronics '78: Year of the Breakthrough," *Wards Auto World*, November 1977; pp. 31-35.
2. "Breaker, Breaker! Factory CBs Want Piece of the Action," *Automobile Design and Development*, October 1977, pp. 24-25.
3. *Automotive News* (advertisements), September 26 and October 31, 1977.
4. Larry Armstrong, "Motorola Cellular System Gets Nod," *Electronics*, November 10, 1977; pp. 74-78.

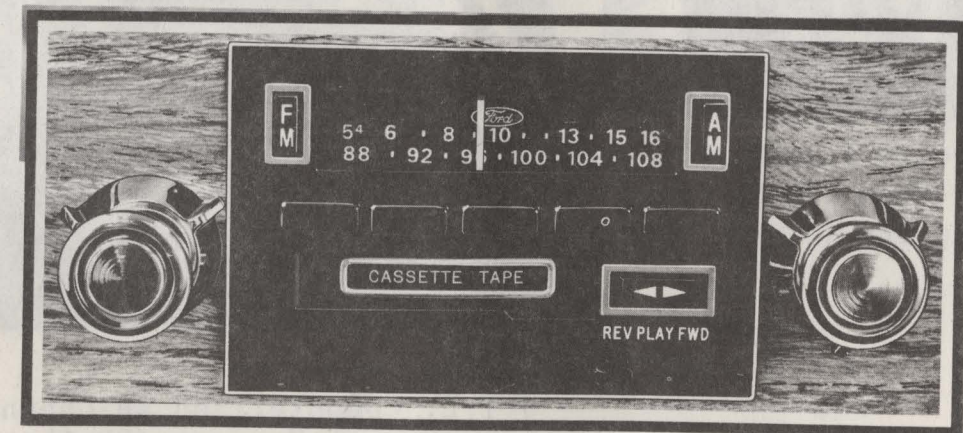


FIG. 1. Ford Motor AM/FM Stereo with Cassette Tape Player, Integral In-Dash Unit (Ref. 3).

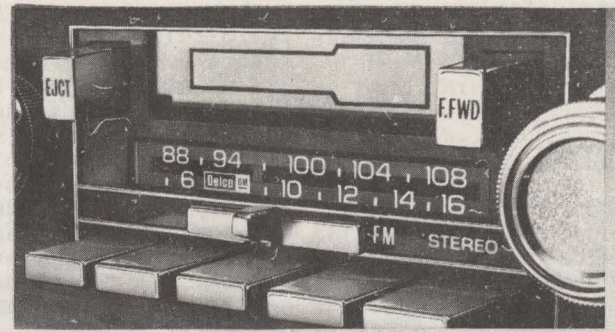


FIG. 2. GM Delco Electronics AM/FM Stereo with Cassette Tape Player (Ref. 3).

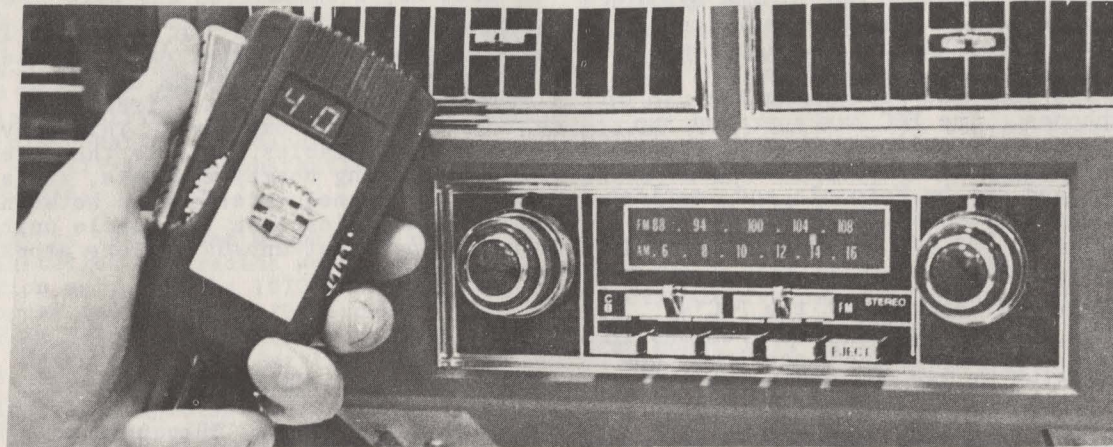


FIG. 3. Delco Electronics Four-Function Entertainment Center, an Integral In-Dash Unit, 40-Channel CB/AM/FM Stereo with 8-Track Tape Player, as Installed in a 1978 Cadillac (Ref.2).

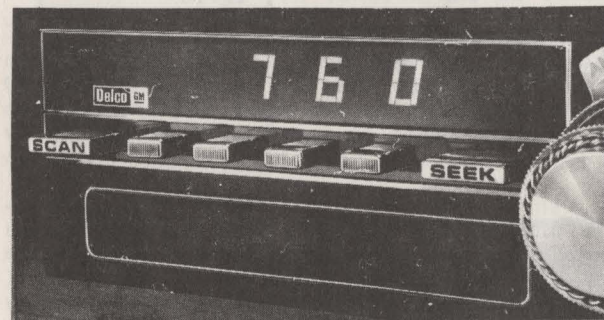


FIG. 4. GM Delco Electronics AM/FM/8-Track Unit, Featuring Signal Seeking and Signal Scan (Ref. 3).

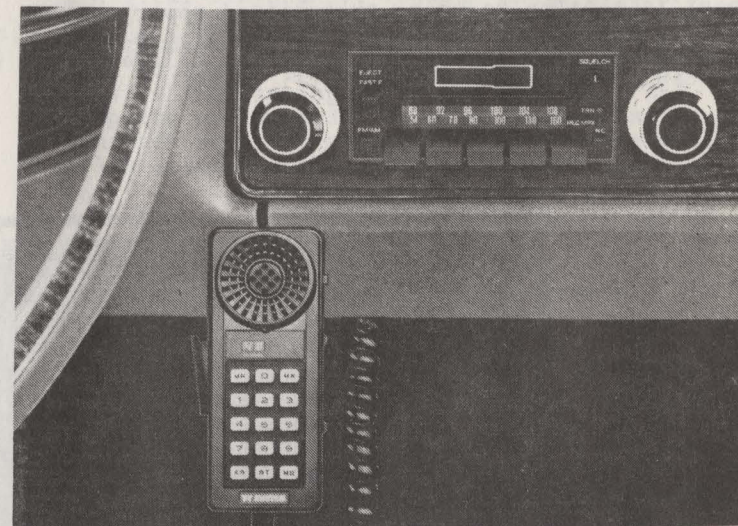


FIG. 5. J.I.L. Computerized 40-Channel CB Transceiver Handset (CB Chassis is Remote Mounted), Connected to J.I.L. AM/FM Stereo with Cassette Tape Player (Ref. 3).

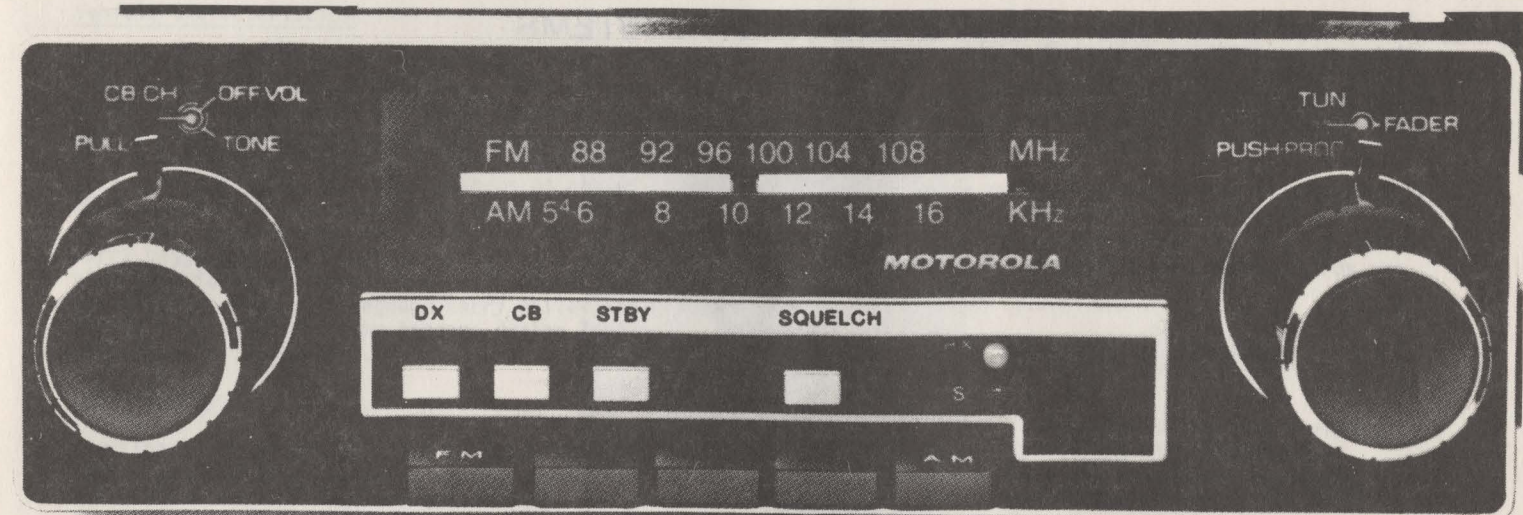


FIG. 6. Motorola 40-Channel CB/AM/FM Stereo with 8-Track Tape Player, Integral In-Dash Unit (Ref. 3).



FIG. 7. Panasonic 40-Channel CB/AM/FM Stereo Integral In-Dash Unit (Ref. 3).

## TRANSPORTATION SYSTEMS



RONALD RULE

### TRANSPORTATION SYSTEMS EDITOR

#### YOUR INPUTS WANTED

Newsletter contributions in the area of Transportation Systems would be greatly appreciated. Simply give me a call, (206) 773-9011, if you want to discuss the suitability or format of an input, or send the information via my address at the beginning of the newsletter. We would like to cover a broad range of areas including: traffic control systems, automatic vehicle identification, location, and monitoring systems, automated transport systems, moving walkways, and other people-movers.

#### FIRST CHOPPER CONTROLLED TROLLEY BUSES

I received a letter from Mr. John Aurelius of Seattle METRO informing us that an order has been placed by two municipalities for the first fleets of chopper controlled trolley buses in North America. The South-eastern Pennsylvania Transportation Authority (SEPTA) of Philadelphia ordered 110 buses, and the Municipality of Metropolitan Seattle (METRO) ordered 109 buses. AM General Corporation is the prime contractor, Randtronics is the propulsion subcontractor, and funding assistance is coming from the Urban Mass Transportation Administration.

It is significant that the chopper system was offered at a price only slightly above that for a conventional switched-resistor propulsion system. Since trolley buses cost far less than railcars, the extra cost of a premium propulsion system becomes visible at a lower level. The chopper provides a radically smoother ride than conventional controls, saves 15-20% in electricity consumption, and has the prospect of savings in maintenance costs.

Randtronics has obtained a 25-year old trolley bus and installed a pre-prototype chopper in it for laboratory and demonstration purposes. Test runs have been made on actual trolley bus routes in San Francisco, up and down grades to 22% with the bus containing the weight of a seated load. First deliveries of production vehicles are scheduled for January 1979.

#### AUTOMATED AIRPORT BAGGAGE SYSTEM

Airport baggage transportation systems are often re-

quired to process large volumes of baggage, have multiple or dispersed load or unload points, sort baggage by flight, and transport it over long distances to satellite terminal facilities. One unique system for meeting these requirements is the Boeing Airport Equipment Telecar System. One such system in the Braniff International's passenger terminal at the Dallas-Fort Worth Airport provides fully automated processing of outbound, inbound and transfer baggage.

#### The Maze Following Vehicles

The track following vehicles are the key to the Telecar System. Powered by linear induction motors, they move through service passageways beneath the floor of the terminal, carrying luggage on almost 8,000 feet of track between various check-in locations, flight make-up areas, and claim carousels. Fully automated belt conveyors and elevators provide interfaces between the vehicles and other types of baggage handling equipment.

Shortest-path routing is also automated. Computers track the vehicles through the underfloor maze, and if a claim area or loading gate number is changed for any reason, individual bags can be redirected in a matter of seconds.

#### The Man-Machine Interface

Outbound bags enter the system at any of Braniff's nine check-in locations. An agent tickets the bags and places them on a conveyor belt. Then he codes the flight number, destination, and number of bags into a keyboard. When an empty vehicle is available, the bags are loaded directly from the conveyor. Computers then dispatch the vehicle to the proper flight make-up area for sorting. Cart unloading is also automated. At each make-up area the bags are pushed from the vehicle onto a belt and sorted into accumulation lanes. Each lane serves a different flight. Attendants transfer the luggage to vans which are trucked to the aircraft for loading.

#### Bar-Code Vehicle Identification

Each vehicle in the system carries a permanent bar-code identification on its side. This code is read by optical scanners located along the track network. Data is fed to the control system which consists of twenty-six mini-computers plus redundant central computers.

#### Vehicle Characteristics

The Telecar vehicle is 36 inches long, bumper to bumper with an overall width of 39 inches. The Telecar complete with a baggage pallet insert weighs 190 pounds and has a payload capacity of 100 pounds. The design of the running gear permits a turn radius as short as five feet and rapid elevation changes at angles up to 35 degrees. Vehicles operate at speeds up to 10 miles per hour. As pictured, the Telecar is designed to carry baggage in the "handles up" position while providing positive restraint during transport. The Telecar insert serves as a baggage carry pallet and effectively "containerizes" the baggage during loading, unloading, and transport.

#### LIM Propulsion

The linear induction motor may be described as a rotary motor with an infinite radius, consisting of a flat stator and a flat rotor (or slider). By placing the linear motor stator in the track and mounting the slider on the bottom of the Telecar, a means of propulsion is obtained that requires no physical contact with the Telecar. Propulsion force (thrust) is generated by means of a traveling wave of magnetic flux. In order to generate this traveling wave, a linear motor stator is wound to have a fixed number of poles along its length, the distance between poles being determined by the physical dimensions of the coils used. By exciting the coils with alternating current, the intensity and direction of the magnetic field at each of the poles vary sinusoidally and "flows" down the length of the stator. A slider, located within the range of this flowing magnetic field, is propelled in much the same manner as a surfboard is propelled on ocean waves.

Speed is determined by the number of poles per linear measure (pole pitch) and the excitation frequency. Physical motor size and power input determine thrust.

#### Optimum System Performance

Several types of stators have been developed to optimize motor performance for the different functional requirements within a baggage handling system. Main line stators are designed to obtain maximum efficiency near their line velocities. Their maximum thrust is approximately double that required by the heaviest loaded car, thus providing a large margin of stability to the system. Incline stators have similar characteristics to their level-run counterparts, but provide the greater thrust needed to propel Telecars up inclines. Low-speed shunt stators are designed to provide maximum thrust at low velocities consistent with typical start/stop operations in storage shunts. Acceleration stators are designed to accelerate a Telecar from a standing stop to the desired line velocity in approximately 0.8 seconds for high-speed accelerators and 0.5 seconds for low-speed accelerators. The motors are packaged to provide simple installation and either individual sequential firing or block firing of motors.

#### SCR Stator Control

All stators are controlled by SCR power switches actuated by solid-state optical sensors preceding the individual units. As the leading edge of a Telecar passes by the sensor, the SCR switch turns on stator current which remains on for a specified length of time sufficient to assure car passage. Thus, motors are activated only when required, reducing their duty cycle with a resultant reduction in size, cost, and power consumption.

One additional advantage of the linear motor is that

failure of an individual stator does not normally have a significant effect on Telecar movement. Since a car traveling at 10 mph will coast several hundred feet, a Telecar will normally coast past a failed stator and be accelerated back up to main line speed by the next operational stator.

The linear motor propulsion system has no moving parts, experiences no wear and requires only minimal cleaning for maintenance. Since the system has no power on the car, no third rail is required and shock hazards are virtually eliminated.

#### URBAN TRANSPORTATION LABORATORY

The General Motors Transportation Systems Division (GM TSD) is currently working with the city of Cincinnati in a cooperative program of research, development and demonstration of innovative public transit services and products. The program, called the Urban Transportation Laboratory (UTL), initially started with a computerized study of a large number of American cities in which the GM TSD analysts identified Cincinnati as being representative of many other medium sized urban areas and, therefore, a preferred site for the UTL.

An existing transportation corridor in Cincinnati was selected for a series of experimental projects with the following objectives:

- 1) Test the sensitivity of transit ridership to improvements in transit service and transit products,
- 2) Evaluate public transit products in terms of their potential effectiveness in improving system performance under realistic operating conditions, and
- 3) Help achieve more balanced urban transportation systems, in which both public and private transportation modes are used more effectively.

At this time, a number of buses have been equipped with GM's Automatic Vehicle Monitoring (AVM) equipment and a series of signpost monitoring units have been strategically placed along bus routes in the selected corridor. Information provided by this data acquisition system can be collected by a control center and used to improve both transit system management and service to passengers.

#### ELECTRIC VEHICLE SYMPOSIUM

The Fifth International Electrical Vehicle Symposium will be held in Philadelphia's Sheraton Hotel October 3--5, 1978. In addition the International Electric Vehicle EXPO II will be concurrently conducted at the Philadelphia Civic Center. Both meetings are sponsored by the Edison Electric Institute's Electric Vehicle Council (EVC). The biennial symposium, conducted in cooperation with EVC's counterpart European organization, will be devoted to technical papers concerning battery-powered road vehicles and hybrids. But the International EV EXPO II, a follow-up to the 1977 meeting in Chicago, will involve exhibits of electric buses, people movers, rail mass transit equipment, and vans and trucks. The meeting will feature a fleet of electric-powered vehicles moving from City Hall to the Philadelphia Museum Of Art.

Information about the conference and the symposium is available from Edward A. Campbell, Executive Secretary, Electric Vehicle Council, 90 Park Ave., New York, N.Y.

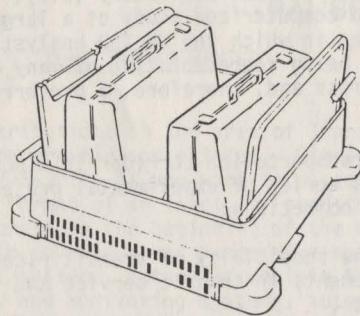
10016. Information about exhibit space is obtainable from Jerry VanDijk, Vice President, Charles Snitow Organization, 331 Madison Ave., New York, N.Y. 10017. Campbell's phone number is (212) 573-8784; VanDijk is reachable at (212) 682-4802.

#### VEHICULAR TECHNOLOGY CONFERENCE

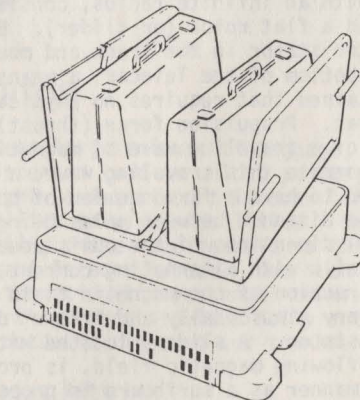
The subject of transportation systems will be one of the highlights at our 28th IEEE Vehicular Technology Conference next month (March 22---24) in Denver. Technical paper sessions have been arranged so that one can attend

transportation sessions on all three days of the conference. Transportation sessions include the following:

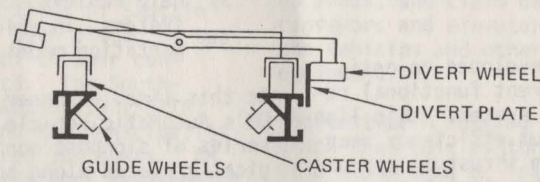
- 1) Electric Vehicles
- 2) Electric Propulsion and Control
- 3) Automated Guideway Transit -- Operational and Reliability Considerations
- 4) Automated Guideway Transit -- Communication and Control
- 5) People Movers -- Past, Present and Future



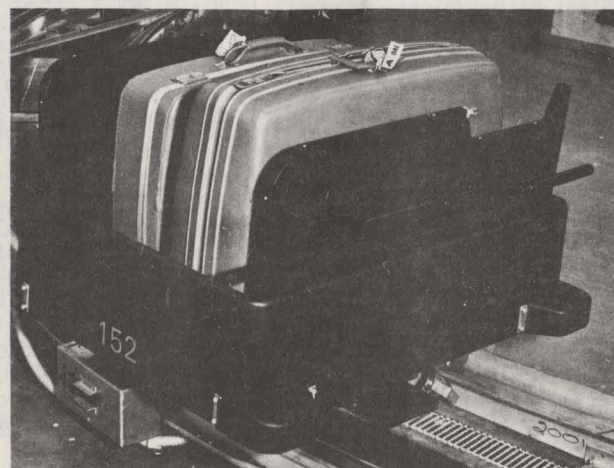
Telecar with insert lowered for transporting baggage.



Telecar with insert raised for loading/unloading baggage.

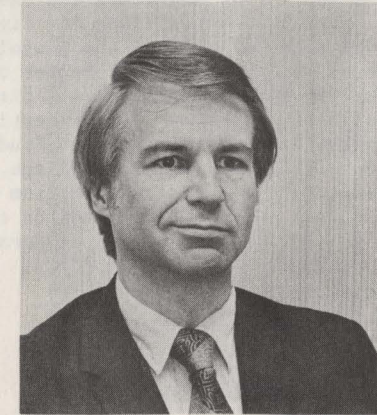


Telecar steering and support system.



The Telecar vehicle passing over LIM stator.

## THE WASHINGTON SCENE



ERIC SCHIMMEL  
WASHINGTON NEWS EDITOR

#### WHAT'S HAPPENING?

Not much, as evidenced by this skimpy column. But then, that's not out of character for the present administration. In this column one year ago, I noted that with a change in administration, some changes in key personnel at the Federal Communications Agencies could be anticipated. At this writing I still cannot give you any specifics other than on the two new commissioners, including the new FCC Chairman.

As the wheels of government turn laboriously forward, it now appears that FCC Chief Engineer Ray Spence, and Safety and Special Radio Services Bureau Chief Charlie Higginbotham will be among the first to be purged. It is likely that their successors will be known to us by the time we convene our annual meeting in Denver. I'm tempted to editorialize on some of these changes, but will reserve any such commentary for casual conversation in Denver.

Ironically, the names of key appointees to the new National Telecommunications and Information Administration are becoming public, although the organization will not officially come into existence for some months. Slated to head the new Commerce Department appendage, is Henry Gellar, a former FCC General Counsel. Don Jansky, presently with the Executive Office of Telecommunications (OTP), is earmarked to head the technical branch. As most of you know, OTP is being dismantled and replaced by NTIA. The Commerce Department's present internal Office of Telecommunications (OT), will also be integrated into the new organization. Since part of OT functions out of Boulder, Colorado, we should be able to get some first hand briefings while in Denver.

As noted above, and in the absence of anything more significant to report, we are reproducing below a recent FCC release of bios of the present Commissioners.

#### FCC COMMISSIONERS

CHARLES D. FERRIS, CHAIRMAN -- Democrat. Born Boston, Mass., April 9, 1933. Nominated FCC Chairman, Sep-

tember 12, 1977, by President Carter. Approved by Senate October 10, sworn in October 17. General Counsel to Speaker Thomas P. O'Neill Jr., U.S. House of Representatives, January-October 1977. Chief Counselor to Senate Majority Leader, General Counsel to Policy Committee, Chief Counsel for Senate Majority, U.S. Senate 1964-1977. Associate General Counsel, Democratic Policy Committee, U.S. Senate, 1963-1964. Trial Attorney, Civil Division, U.S. Department of Justice (Attorney General's Honors Program), 1961-1963. Assistant professor, Naval Science-Marine Engineering, Harvard University, 1958-1960. Chief engineer, U.S.S. Brinkley Bass (DD887), 1955-1960. Research physicist, Sperry Gyroscope, Great Neck, N.Y., 1954-1955. Boston College, AB in Physics, 1954; Boston College Law School, J.D., 1961. President of class and Editor of Law Review. Harvard University Graduate School of Business, Advanced Management Program, 1971.

ROBERT E. LEE -- Republican. Born Chicago, Ill., March 31, 1912. Appointed Commissioner by President Eisenhower in 1953. Reappointed by President Eisenhower in 1960 and by President Johnson in 1967, and President Nixon in 1974. Was auditor before joining Federal Bureau of Investigation as Special Agent in 1938. Served as Administrative Assistant to J. Edgar Hoover at FBI, and as Director of Surveys and Investigations for Appropriations Committee of House of Representatives.

JAMES H. QUELLO -- Democrat. Born Laurium, Mich., April 21, 1914. Nominated to Commission by President Nixon on September 20, 1973, confirmed by Senate on April 23, 1974, sworn in April 30, 1974. Rose from position of promotion manager radio station WJR, Detroit, Mich., 1947, to Vice President, General Manager 1960; retired as Vice President, Capital Cities Broadcasting Corporation in 1972. Was a Detroit Housing and Urban Renewal Commissioner 1951-1973, and trustee Michigan Veterans Trust Fund 1951-1974. Was member of the Governor's Special Commission on Urban problems; Governor's Special Study Committee on Legislative Compensation; Assistant National Public Relations Chairman V.F.W.; TV-Radio Chairman United Foundation; Executive Board Member of Boy Scouts of America; and Board member American Negro Emancipation Centennial.

ABBOTT M. WASHBURN -- Republican. Born Duluth, Minn., March 1, 1915. Nominated to Commission by President Nixon, in 1974. Sworn in July 10, 1974. Reappointed by President Ford in 1975. Sworn in October 9 for full



7 year term. Director, Department of Public Services, General Mills, Inc., in 1940's. Executive vice chairman of Crusade for Freedom (Radio Free Europe), 1950-51. Eisenhower Presidential campaign staff, 1952. Deputy Director, U.S. Information Agency 1953-61. President of international public affairs counselling firm of Washburn, Stringer Associates, Inc., 1962-68. In 1969 appointed deputy chairman of U.S. delegation to INTELSAT Conference. Chairman of INTELSAT negotiating conference, with personal rank of Ambassador, 1970-71. Special consultant to the director, the White House Office of Telecommunications Policy, 1971-74.

JOSEPH R. FOGARTY -- Democrat. Born Newport, R.I., January 12, 1931. Nominated to FCC by President Ford, confirmed by Senate September 8, 1976, sworn in September 17, 1976. Member of the United States Navy from 1953 until 1959. Joined the Lowell, Mass., law firm of Enos & McCarthy in 1959. From 1964 to 1966 was with the firm of Moore, Vigadamo, Boyle & Lynch, in Newport, R.I. Joined U.S. Senate Commission on Commerce as Staff Counsel in 1966. Named Communications Counsel for Committee in 1975.

MARGITA E. WHITE -- Republican. Born in Sweden June 27, 1937. Became U.S. Citizen in 1955. Nominated to Commission by President Ford, confirmed by Senate September 8, 1976, sworn in September 23, 1976. Named Administrative Assistant for the Honolulu office of Whitaker and Baxter Advertising Agency in 1961. In 1963 named Minority Press Secretary for the Hawaii House of Representatives. Research aide to Senator Barry Goldwater and research associate with the Republican National Committee in 1963 and 1964, and research assistant and writer with the Free Society Association in 1965 and 1966. From 1967 to 1969, was research assistant to the late syndicated columnist Raymond Moley. From January 1969 to February 1973, was assistant to Herbert Klein, Director of Communications for the Executive Branch of the Government. Was Assistant Director of the United States Information Agency (Public Information) from 1973 until 1975. Appointed Director of the Office of Communications on June 18, 1975. Received the United States Information Agency's Superior Honor Award in 1975. Is founding member and current secretary of Executive Women in Government.

TYRONE BROWN -- Democrat. Born Norfolk, Va., November 5, 1942. Nominated to FCC by President Carter, confirmed by Senate November 4, 1977, sworn in November 15. During 1967 term of U.S. Supreme Court, served as law clerk to Chief Justice Earl Warren. Associate attorney with the Washington, D.C., law firm of Covington and Burling, 1968-1970. Special investigator in Jackson, Miss., for the President's Commission on Campus Unrest in 1970. 1970-71, assistant to Senator Edmund S. Muskie (D.-Maine), then became staff director of the U.S. Senate Intergovernmental Relations Subcommittee. Director and vice president for legal affairs of Post-Newsweek Stations, Inc., 1971-74. In

June 1974, joined Washington tax law firm of Caplin and Drysdale as an associate attorney. Member of board of directors and executive committee of National Lawyers' Committee for Civil Rights Under Law and a public member of the Administrative Conference of the United States. Member of D.C. Unified Bar and New York State bar. A director of Washington Chapter of American Civil Liberties Union and Washington Center for Metropolitan Studies. Received A.B. with honors from Hamilton College, Clinton, N.Y., 1964, and LL.B., with distinction from Cornell University Law School, 1967; managing editor of Cornell Law Review; received Frazer Prize for leadership and academic achievement.

### INTERFERENCE

During the past year and a half, the most visible and pervasive aspect of mobile radio regulation, has been the FCC's focus on inter-service interference. The word itself would probably qualify for the noun-of-the-year award. Much has been written on this, and in addition to numerous trade and press articles, a number of booklets and reports have been published to assist the industry in dealing with various types of interference problems. The most prominent of these are listed below for your reference.

FCC- How to Identify and Resolve Radio-TV Interference Problems, May 1977  
GPO No. 004-000-00345-4

The Extent and Nature of Television Reception Difficulties Associated with CB Radio Transmissions, July 1977  
FCC/FOB/PD&E 77-02

Interference to Audio Devices and Receivers from Signals Near 27, 220, and 900 MHz., November 1977  
FCC/OCE RS 77-03

Electronics Industries Association/ Consumer Electronics Group

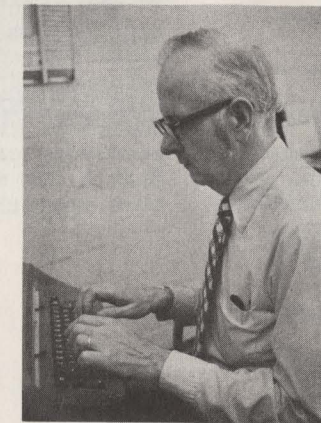
Consumer Electronics Service Technician Interference Handbooks

Unit 1: Television Interference  
Unit 2: Audio Rectification

Hi-Fi News and Record Review

Audio Radio Frequency Interference: Its Cause and Cure, March 1974, Harry Leeming

## DIAGNOSIS, DEFT, & DIRECT



A.K. "KENNY" GUTHRIE  
COMMUNICATIONS EDITOR

This isn't a "What to do 'til the doctor comes" article. Instead, we assume that you are the "doctor" and that you're already face to face with a "patient"--a "sick" two-way radio. Your task is to move from symptom, to proximate cause, to "treatment" and then to "cure"--with directness which befits a professional practitioner of the art. This image is enhanced when you focus quickly on the portion of the radio which needs fixing, and avoid fouling-up the portions which don't need your ministrations!

There is a systematic approach to troubleshooting which fits any transmitter or receiver which ever worked properly--be it big or little and whether its normal habitat is on land, on wheels or on feet. It's built on standard performance tests plus a few observations of fact, done in an order which yields valuable information fast and minimizes test equipment manipulations. The procedures are detailed in the troubleshooting charts, taken from my new Test & Troubleshooting Handbook (available postpaid for your \$ 2.50 check to GE Marketing Communications, Box 4197, Lynchburg, VA. 24502).

You enter each chart at the upper left and make the first test or observation. If the results are "normal" you move down. If they are "abnormal" you move to the right. When you reach a "TROUBLESHOOT" entry, you're in the broad area--the next step is up to you. Find and fix the specific problem, and get back on the track. When you reach the bottom, the job is done.

For transmitters, the first jump is the big one. Normal power output is prima facie evidence that everything in the chain from oscillator to antenna changeover switch is in "apple pie" order. Move down to the next step. If power output is abnormal (including zero) you know something is wrong but little more. Start at one end of the chain and work toward the other, using the test indicators in the unit and procedures in its maintenance manual.

Inability to set to the proper frequency points toward the crystal, oscillator circuit or the compensating circuit.

When the transmitter passes the maximum deviation test, you know that the entire audio

path (from input through modulator) is alive. If you can't adjust maximum deviation high enough, look for low audio gain or modulator trouble. When deviation dissymmetry (in hard limiting) is unacceptable, recheck with audio input well below limiting. If output becomes symmetrical, the modulation limiter is suspect. If output remains non-symmetrical, look for modulator trouble or gross audio distortion. With a major portion of the audio/modulator circuitry checked out, failure to display normal audio sensitivity usually points to audio gain problems. Excess audio distortion, when found at this point in the sequence, leads you to the audio stages.

### RECEIVER TROUBLESHOOTING

The first "test" requires no test equipment! With no signal applied and the Channel Guard ('scuze me...I mean "tone squelch") decoder disabled, rotate the squelch control over its full range. If the receiver squelches and unsquelches normally, you know that a whole lot of things are right...noise is being produced in the mixer(s), there is enough IF gain to drive the detector, there is enough detector output to drive the squelch circuits, the audio amplifiers amplify, the squelch circuits do their thing, and the switched amplifiers do switch. About all which remains in major doubt is the pre-mixer RF gain and the status of the injection chain! If the receiver won't unsquelch and make noise, the chart leads you in the right direction.

Audio distortion, which is taken with a "rock crushing" signal, verifies that the injection chain is alive, gives you a chance to set or verify frequency, confirms that you can developed rated audio power, and confirms the distortion performance. No response points to the oscillator/injection circuits. If distortion is too high, recheck distortion with greatly reduced modulation deviation. If the distortion remains, look for trouble in the detector or audio stages. If it clears, look for IF selectivity problems.

Failure to pass 12 dB SINAD sensitivity implies lack of gain or improper selectivity (gross audio distortion having been ruled out). If 20 dB quieting sensitivity, run

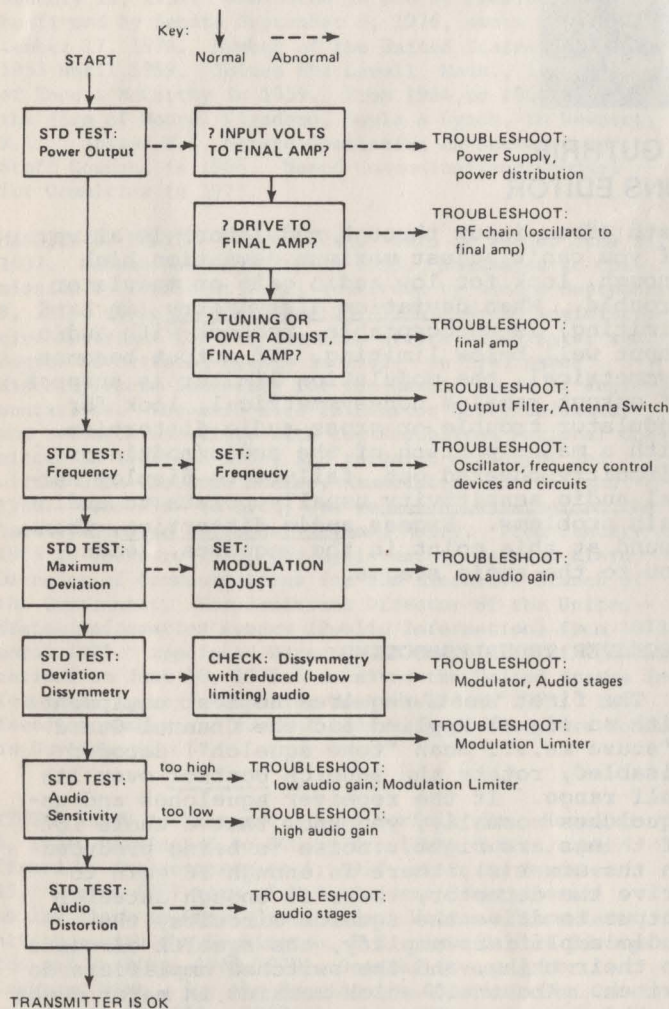
next, is failed, you have a gain problem. If passed, you have a selectivity problem.

If results from the modulation acceptance bandwidth are sub-standard, look for IF selectivity trouble. And if Critical & Maximum Squelch numbers can't be met, having gone this far successfully, you do have squelch trouble.

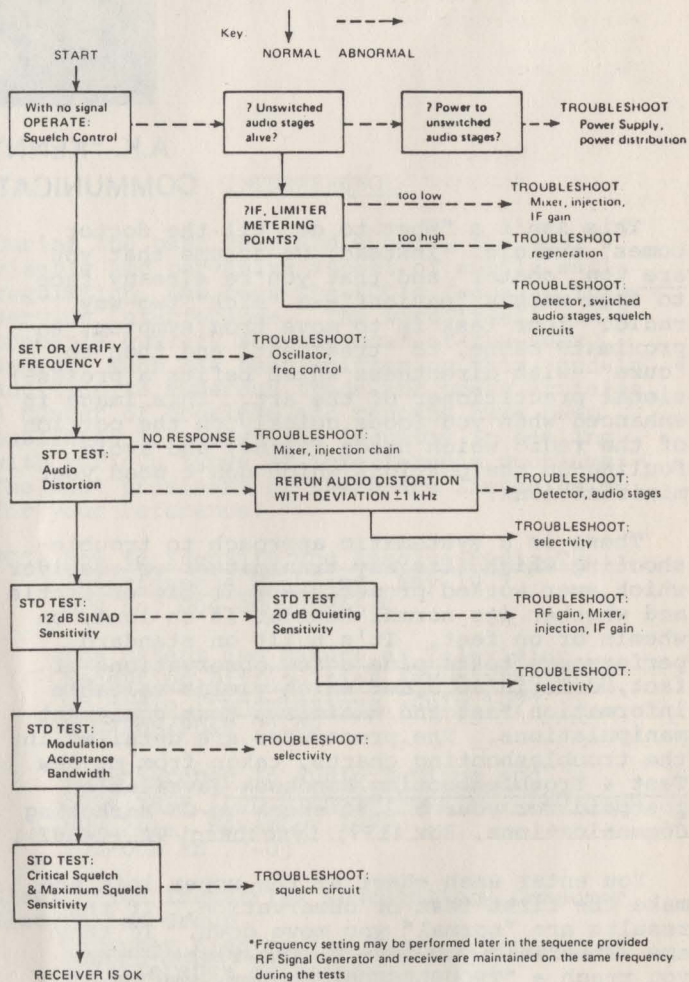
#### CHECKOUT PAYS OFF

The troubleshooting sequence minimizes the test equipment manipulations, making the ideal order for equipment checkout. Given a well arranged bench with Service Monitor, direct-reading SINAD meter and a dedicated distortion analyzer, the entire sequence, transmitter and receiver, can be run in less than 2 minutes! That's not much effort to swap for the assurance that the radio is right!

#### TRANSMITTER TROUBLESHOOTING



#### RECEIVER TROUBLESHOOTING



### CALL FOR PAPERS 3RD WORLD TELECOMMUNICATIONS FORUM

GENEVA, SWITZERLAND  
SEPTEMBER 23-26, 1979

The World Telecommunication Forum 1979 will focus on "The integration of the world's communications network-Technologies of the eighties". Highly technical and scientific in character and yet at the same time universal, Forum 1979 is recognized as the world's leading congress of communications specialists. It will be sponsored by the International Telecommunication Union (ITU) on behalf of its 153 member countries in association with a great number of national and international professional engineering societies and scientific institutions.

You are invited to submit an original, unpublished paper reporting ideas or experiments relevant to the Forum 1979 theme. Suggested technical topics are listed hereunder.

In addition to 15 plenary and parallel sessions with some 150 invited and carefully selected papers, one special session of the Forum will be devoted to the celebration of the 50th anniversary of the International Radio Consultative Committee (CCIR). Present and future activities of the CCIR will be described in technical contributions read by world leaders in this field.

One-page abstracts (100-200 words) should be submitted before 30 September 1978. If the abstract is accepted by the Paper Review Board a full paper, the text of which should not exceed 6000 words, will be expected by January 15, 1979, for reproduction in the World Tele-

communication Forum Proceedings. Papers should be submitted preferably in English, French or Spanish and the oral presentation should be planned for 20 minutes. Authors of accepted papers will be required to submit preliminary versions of the visual material to be used at the presentation. They will receive forms and instructions for material to be printed in the Forum Proceedings.

#### ABSTRACTS AND PAPERS SHOULD BE SENT TO:

Professor Dr. F. L. Stumpers  
Chairman, Technical Programme Committee  
World Telecommunication Forum  
N.V. Philips' Gloeilampenfabrieken  
Research Laboratories  
Eindhoven  
(Netherlands)

#### OR TO:

Mr. W. G. Wolter  
Chairman, Management Committee  
World Telecommunication Forum  
International Telecommunication Union  
Place Des Nations  
CH-1211 Genève 20  
(Switzerland)

#### IN THE UNITED STATES AND CANADA, ABSTRACTS SHOULD BE SENT TO:

Mr. A. E. Joel, Jr.  
Past President  
IEEE Communications Society  
Bell Telephone Laboratories  
Room 2C-632  
Holmdel, New Jersey 07733  
(United States)

#### MAIN SUBJECT AREAS:

This list of topics is intended to give an appreciation of the scope of technical subjects to be investigated at the World Telecommunication Forum Technical Sessions. It is not intended to be complete. The Program Committee welcomes your suggestions for additional subjects.

#### The Integration of the World Telecommunication Network

- The World Telecommunication Network - An Overview
- Structure and Technology
- Communications Systems
- Services
- Customers' Needs
- Future Demand on Technology and Services

#### From Existing to New Telecommunication Networks

#### New Technologies - New Potentials in Telecommunications

- New Developments in Communications (Switching, Radio, Data Transmission, Optical Fibre)
- System Performance
- Implementation Strategies
- New Facilities/New Services: Demand from the Customers

- Evolution and Implementation of New Networks
- Transition from Existing to New Networks
- Economic and Social Implications
- Operational Aspects of Systems

#### The Future of Worldwide Integrated Communications

- The Role of the ITU (Standardization, Frequency Management, Planning, Coordination)
- Integration of Systems
- Integration of Services
- Telecommunication Studies
- Network Models for the Future

### ADVANCED TRANSIT AND URBAN REVITALIZATION - AN INTERNATIONAL DIALOGUE

HYATT REGENCY HOTEL  
Indianapolis, Indiana  
April 24-28, 1978

A major international conference on innovations in urban transportation will be held this spring under auspices of the newly-formed Advanced Transit Association (ATRA).

ATRA is an international organization devoted to improvement of urban transportation by the judicious application of appropriate advanced transit technology and dedicated to open, objective and thorough evaluations of all transit alternatives.

"Advanced Transit and Urban Revitalization -- An International Dialogue" will be the theme of the four-day session, April 24-28, at the Indianapolis, Indiana Hyatt Regency Hotel. Some 500 delegates are expected from around the world to join in discussions of urban transportation problems and how they can be solved.

Dr. E. Henry Lamkin, Jr., majority leader of the Indiana House of Representatives and an ATRA board member, will be general chairman for the event. Robert L. Paullin, Research and Development Resources Manager for the U.S. Department of Transportation, will be program chairman.

Mornings will involve panel discussions with participation by urban planning officials, land developers and architects, transit operators, manufacturers, legislators and other government officials. Afternoons will be devoted to the presentation of more than 100 technical and non-technical papers. There will be continuous programs and exhibits of interest to both lay people and professionals.

Among speakers already committed are Howard Kehrl, executive vice-president for research and development at General Motors Corporation, and John Hirten, director of the American Institute of Planners.

Conference planners do not want to concentrate on any single mode of transportation. Technical papers representative of all types of systems, including: fixed railways, the newer electrical vehicles, auto-

matically-controlled vehicles, demand-response systems, advanced bus transit services and others are needed.

ATRA hopes to attract major exhibitors from both the public and private sector study many transportation

Attendees will emerge from the conference with keener insights about

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tions of advanced transit technology and the integration of a variety of transit modes, but also, with greater knowledge about such matters as environmental and energy issues, land development impacts, fiscal impact, and financing methods.

ATRA is headquartered in Washington, D.C., and its Edward Anderson, chairman of the National Council of Engineering at the University of

### 1977 ELECTION RESULTS

Ballots for the election of the VTS Administrative Committee were received and counted last fall just prior to the December 1977 ADCOM meeting in Los Angeles. The following nominees were elected:

- Carl Brooks, who is currently with the Antenna Specialists Company as Vice President-Engineering.
- Trevor Jones, Director of the General Motors Proving Grounds in Milford, Michigan.
- Sam Lane, VTS Junior Post Chairman and Vice President of Moviola/Magnasync.
- Fred Link, Consultant and whom we all know.
- Sam McConoughey, Chief of the FCC Mobile Services Division in the Common Carrier Bureau, Washington, D.C.

The terms of the candidates began on January 1, 1978 and run through December 31, 1980.

This is a particularly fine slate this year and we welcome you aboard. Congratulations to all of you.

Nick Alimpich  
Chairman, Nominating Committee

### MEETING NOTICE AUTOMOBILE RADAR

A technical session on automobile radar is planned for the upcoming 1978 SAE Congress and Exposition in Detroit on Thursday, March 2, 1978. Following the paper presentations, an informal panel discussion entitled, "Automobile Radar - Where do we go from here?", will be conducted to address the present status and future plans for automobile radar warning, headway control and automatic braking systems. The panel discussion will reflect views from industry and government from within as well as outside the U.S.

A list of the panelists is given below:

Panel Chairman: Dale Grimes; Head, Electrical Eng. Dept., University of Texas

Panel Members: Erwin Belohoubek; Head, Microwave Circuits Technology, RCA Laboratories

Werner Fogy; Representative for the German Government

Trevor Jones; Director, GM Proving Grounds, General Motors Corporation

Scott Shadle; Safety Standards Eng., U.S. Department of Transportation

William Troll; Group Manager, Bendix Research Laboratories

It is anticipated that a sixth panelist will be added to present the Japanese view on this subject.

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*Kathy Baker*  
*20th* *2100P*

*Sandy*  
*need cc of listing*  
*2 copies of W-2*  
*need cc of divorce Decree*  
*need all of assets & liabilities*  
*via as inc*  
*forms*  
*\$175 app. 2 credit reports @ 31/ka*