



NEWSLETTER

VEHICULAR TECHNOLOGY GROUP

FEBRUARY 1976



WASHINGTON MONUMENT

The nation's monument to George Washington is, by law, the tallest building in Washington, D.C. At 555 feet, it's also the tallest masonry structure in the world.

Photo by Washington Area Convention and Visitors Bureau

MOBILE RADIO WEEK IN WASHINGTON

26th ANNUAL
VTG CONFERENCE
...MARCH 24-26

THE NEW PRESIDENT'S MESSAGE

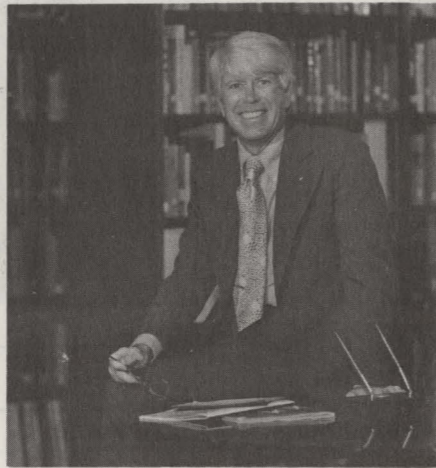
This message is my first opportunity to establish communications with the complete Vehicular Technology Group (VTG) membership. I hope this will result in an effective two-way exchange of information, ideas, and suggestions. Your comments -- pro or con -- will always be welcome.

I feel fortunate to have worked during these past eight years on the Administrative Committee (ADCOM) with four extremely capable Presidents, Jack Renner, Bob Bloor, Marty Cooper, and Nick Alimpich. Each contributed his special talent and resulted in the VTG remaining a viable and successful organization. Nick and Marty are currently serving on ADCOM and will provide the continuity necessary for further improvement.

The challenges which face your new officers for the year 1976 are formidable. After reviewing and updating the five-year plan formulated in June 1974, the executive committee adjusted some priorities. It is our opinion that we will get the most benefit from our effort by concentrating on the TRANSACTIONS and our Annual Conference. To this end, I have tasked each ADCOM member to actively participate in improving the TRANSACTIONS and the Annual Conference while still continuing on their regular committee assignments. The general membership should be aware, however, that the VTG, as is true of many other volunteer organizations without a paid staff, must depend upon a broad segment of the membership to be successful. Please take a few moments to list some suggestions for improving the TRANSACTIONS and Annual Conferences and consider how you (personally) can actively participate in the improvements. I look forward to your comments and suggestions.

The TRANSACTIONS, under Editor George McClure, are on the road towards significant improvement even though publications for 1975 did not meet expectations. Issues that contain only two or three papers are not indicative of the progress being made in the Land-Mobile Communications, automotive electronics, maritime/airborne communications, and personal paging technologies. George has assured me that with the papers presently under review, papers to be published in 1976 will be more than double those in 1975. Our goal for 1980 will be regular quarterly issues of 100 pages each.

Special issues are also being developed. An issue devoted to position location and automatic vehicle monitoring systems is well under way with 13 papers being considered at this time. CONVERGENCE '76 will be the source of a special issue devoted to automotive electronics. Emergency medical communications, marine communications, 900 MHz and propagation being considered for special issues.



Preparations for the next Annual Conference in Washington March 24-26, are moving ahead. Conference Chairman, Stu Meyer, has advised that several important industry and government communications organizations are scheduling meetings and conferences in Washington during the same week on a non-interfering basis. The convergence of these groups will assure a significant increase in attendance. Conference Paper Chairman, Sam McConoughey, reports that the number of quality papers submitted are in excess of the time presently allocated. Parallel sessions or expansion to a 2-1/2 day technical program are being considered. Additional information on the individual papers and presentations will be published shortly.

I would like to encourage the entire membership to support the Annual Conference. Number one priority is for you to be there personally. Convince your management that your attendance is vital in maintaining your technical proficiency and industry awareness. Second, inquire among your associates in industry if they are going to sponsor an exhibit. Encourage vendors to participate and display the latest innovations. Our membership includes a significant number of people representing users who invest millions in products and services. The VTG conference is the logical meeting ground for the professionals in our industry to meet and exchange information.

Our very capable Newsletter Editor, Olin Giles, will no doubt be concerned of the length of this message; however, I believe it is vital for the members and the Administrative Committee to communicate.

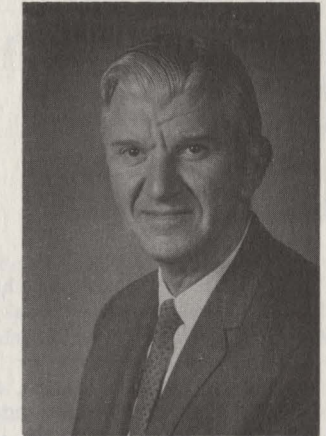
I have provided some information subjects we feel are important. What are your suggestions and comments? We do want to hear from you.

SAM LANE

THE OUTGOING PRESIDENT'S MESSAGE

This will be my last letter to you as President of the Vehicular Technology Group. Let me say right at the start that it has been a pleasure to serve you. Through the efforts of our Adcom members and various committees, we have had an opportunity to work with many dedicated and enthusiastic VTG members. And our goal has always been to serve all the members of the VTG. From previous articles I have written, you surely must have gleaned by now the idea that VTG is multi-faceted. We not only serve those strictly interested in communications, but those interested in a variety of areas (marine radio, automotive electronics, transportation systems, etc.) all under the umbrella of the Vehicular Technology Group. There are reasons for this, of course, and one of the most important reasons is the need to generate more papers for the VTG Transactions. The size of our Transactions (or the lack thereof) lately should verify the last statement! You should also be aware of the fact that all IEEE groups are reviewed periodically for the maintenance of their viability. The review considers, amongst other things, the timeliness, the quality and the size of Groups Transactions. Similar consideration is given to the Newsletter. Another important factor is the number of Conferences that are promoted and held. This would include National or regional conferences and symposia. In short, those areas that truly provide a membership service are given heavy weighting.

The need for more papers should now be evident, and, frankly, we just have not been getting the required paper flow from the communications area of our interest. We know the material is out there and your officers and Adcom have initiated positive programs to produce these papers. And, as in any other business, if your market area is limited, you must diversify your interests if you are to retain your individual identity. This is why we have dedicated ourselves to the ferreting out of more communications papers and to the solicitation of more automotive electronics and transportation-oriented papers.



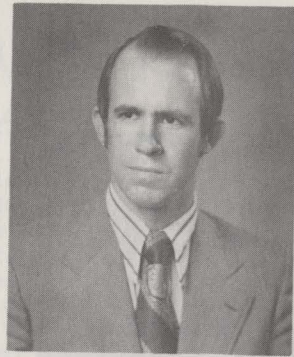
As your past President, I have done my best to generate a 5 year plan in order to assure maintenance of our autonomy and the Groups viability. In the last year alone, we have given you a timely and useful Newsletter. The Transactions are just about on time now, and one of our foremost goals is to fill it up with timely and useful papers from all areas of interest.

Needless to say, this has required the introduction of fresh, new ideas into the Group through the injection of youthful vigor into our Adcom. Continuity of the Group is maintained through your executive committee and last, but certainly not least, is the fact that you are dealing with volunteers whose only reward is your appreciation for their efforts of providing you with useful products: Transactions, Newsletters, Conferences and peripheral services.

On this note, I want to thank each and every Adcom member/officer with whom I have worked for the past 5 years. In addition, I want to thank all of you for your support of the VTG through your membership in the Group and your attendance at our National Conferences and regional symposia. May this bicentennial year 1976 be prosperous for each and everyone of you and the Vehicular Technology Group.

NICK ALIMPICH

EDITOR'S NOTES



You are receiving this February issue of the Newsletter one month later than the schedule previously called for. A shift became necessary to bring the Newsletter in sync with the new late March time-slot for the annual conference. Without this change in dates, timely information, either before or after the conference, would have been minimal in this Newsletter.

The 26th Annual VTG Conference is scheduled for March 24-26 in Washington, D.C. There is so much of interest to the land mobile community going on in Washington that week, that it seems appropriate to call it "Land Mobile Week in Washington". The program agenda, information on events going on in Washington, and abstracts of most of the technical papers are included in this Newsletter. I would like to thank Stu Meyer, Conference Chairman, and Sam McConoughy, Papers Chairman, for providing me with information on the conference.

In this issue, you will also find the results of the recent ADCOM election and biographical profiles of the newly elected members. A call for nominees for the 1976 election is also included, so give this some thought and respond if you want to recommend candidates.

Articles have been contributed by each of the Newsletter Staff Editors for this issue. I believe you will find them interesting and informative.

Please note that the new deadline for the next issue is May 5, 1976. I'll close for now. See you in Washington.

OLIN GILES

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VTG NEWSLETTER DEADLINES

| Month of Issue | Final Copy To be Rec'd By Editor* | Target Mailing Date |
|----------------|-----------------------------------|---------------------|
| May | 5-3-76 | 5-28-76 |
| August | 8-2-76 | 8-27-76 |
| November | 11-1-76 | 11-26-76 |
| February | 1-3-77 | 1-28-77 |

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

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26th ANNUAL VTG CONFERENCE ...WASHINGTON, D.C. ...MARCH 24-26



In keeping with the nation's celebration of this country's bicentennial year, the 26th annual VTG conference will be held in Washington, D.C., March 24-26. An excellent agenda of over thirty technical papers will be presented, covering the broad spectrum of interest to the VTG: 900 MHz, vehicle location, public safety communications, EMS, transportation systems, common carrier mobile telephone, automotive electronics, plus a number of other special interest subjects.

A wide variety of exhibits will show the latest in land mobile equipment, as well as accessory items. Several Federal Government Agencies will display, including a special FCC presentation on man-made interference. The association of Public Safety Communications Officers (APCO) will have a booth to discuss their forthcoming annual conference in New York City.

This conference is the first of a series of planned annual conferences in the late March time-frame, having been previously held for many years in early December.

But there is much more of interest to the land mobile community in Washington, D.C., during the week of the annual conference. For example:

- The Land Mobile Section of the Electronic Industries Association will meet in the Nations Capitol. (Date to be announced)
- The Land Mobile Communications Council (LMCC) will meet on Tuesday, March 23rd.
- The Operational Fixed Microwave Council (OFMC) will meet on Friday, March 26th.
- The National Association of Business and Educational Radio (NABER) will conduct a Senior Communications Symposium on Wednesday, March 24th. This session will deal with Federal Regulation (particularly the FCC) of the land mobile services.

Prominent Regulatory personnel will take part in this event.

- The American Radio Relay League (ARRL) will conduct a Technical Symposium on Wednesday Evening, March 24th. This session will include a number of papers dealing with Amateur Radio Projects that are of interest to the Land Mobile Community.
- The Washington Section of the Radio Club of America will sponsor the first Radio Club of America Semi-Annual Banquet. President Fred Link will be on hand along with a number of Directors, Officers and committee members.

With all of this activity, surely there is something for everyone during Mobile Radio Week in Washington, D. C.

* * * * *

Conference site: Statler Hilton Hotel
16th and K Street, N.W.
Washington, D.C. 20036
Phone 202-393-1000

A block of rooms has been reserved in the name IEEE, so mention this when you call or write for reservations. Direct limousine service is available to the Statler Hilton from Baltimore International, Washington National, and Dulles International airports. Schedules for the limousine service will be mailed to all registering for the conference. A tear-out pre-registration form follows this article.

An advance program will be mailed to all VTG members. If you are not a VTG member and want an advance program, write to:

Mark Crosby c/o SIRSA
1901 N. Moore St. (Suite 602)
Arlington, Va. 22209

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THE U. S. CAPITOL, WASHINGTON, D.C. - Perhaps the most famous building in the United States, the Capitol is where Senators and Congressmen meet to enact the laws of the land. Photo courtesy Washington Area Convention and Visitors Bureau.

PRELIMINARY AGENDA - 26th VEHICULAR TECHNOLOGY CONFERENCE

- March 23rd: Tuesday
8:00 PM Executive Committee Meeting (in President's Suite)
- March 24th: Wednesday
9:00 AM to 5:30 PM - Registration
9:00 AM - Noon - PUBCOM Meeting
9:00 AM - 4:00 PM NABER Senior Communication Symposium
1:30 PM - 5:00 PM ADCOM Meeting
3:00 PM - 5:30 PM Preview Opening of Exhibit Area
7:30 PM - ??????? ADCOM Dinner (Cocktails at 6:30 PM)
7:30 PM - 11:00 PM ARRL Technical Symposium
- March 25th: Thursday
7:30 AM - 8:45 AM Authors Breakfast
8:00 AM - 5:30 PM Exhibit Area Open
9:00 AM - 4:30 PM Technical Sessions
NOON to 1:30 PM Luncheon with prominent speaker
6:00 PM - 7:30 PM Cash Bar (Hors D'oeuvres by VT Conference)
7:30 PM - ??????? RADIO CLUB OF AMERICA 1st Semi-Annual Banquet
- March 26th: Friday
8:00 AM - 1:30 PM Exhibit Area Open
9:00 AM to 4:30 PM Technical Sessions
NOON to 1:30 PM Lunch with prominent speaker

* * * * *

CONFERENCE OFFICERS

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E.F. Johnson Co.
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* * * * *

At press time, abstracts of all the papers were not available. A partial listing follows ---

ABSTRACTS OF CONFERENCE PAPERS

An X-Band System for Automatic Location and Tracking of Vehicles Using Semi-Passive Signpost Reflectors

Gerald S. Kaplan
Andrew D. Ritzie
RCA Global Communications
Piscataway, New Jersey

A new system for the location of vehicles by means of a grid of semi-passive "sign-post" reflectors is described, and the results of actual field tests of the system in urban and suburban environments are presented. The design is such that access to utility power is not required, permitting a simple and inexpensive installation.

Microwave energy (in the 10 GHz range) is used to interrogate the sign-post reflectors. The interrogator on the passing vehicle "reads" the coded reflection to ascertain the precise location. The signal is coded at each reflector by means of a pre-set phase modulation, unique for each location. This modulation is decoded in the car-emplaced receiver, and the location information can then be sent via the vehicle's two-way radio to a central location for control purposes.

* * *

A New Simple Switching-Diversity Technique for Digital Land Mobile Radio

F. Adachi
T. Hattori
K. Hirade
T. Kamata
Nippon Telegraph and Telephone Corporation
Yokosuka, Japan

This paper describes a new simple switching-diversity technique without level detection. It adopts such method as to receive alternatively two RF signals received from different antenna branches at an adequate frequency.

A few experimental tests have proved that this technique gives a significant improvement in signal transmission performance under the simulated Rayleigh fading channel at 900 MHz band.

* * *

Vehicular Data System Using Microcomputers for Computer-Aided Police Dispatch System

H. Drake
J. E. Pera
J. Pedroso
Rydax, Inc.
San Rafael, California

A system has been supplied for the Caracas Metropolitan Police Department incorporating two-way status reporting and message decoding data units in cars, one-way transmitter identification for personal radios and motor-cycles, and complementary communications center equipment for recording and generation of data messages, and processing for dispatch use by computer.

* * *

Address Security Concepts for Mobile Telephone Service

Michael Oleyar
Martin Marietta Aerospace
Orlando, Florida

Described are techniques that detect and deter the unauthorized use of radio channels intended for common carrier subscribers to a mobile telephone service utilizing an exchange under stored program control. Emphasized are the approaches that are more efficient through the use of common channel signaling and one that relies on digital passwords changed automatically on a per-call basis. A comparative analysis of the impact on call processing and other processor requirements is presented.

* * *

Leaky Coaxial Cable Characteristics at 900 MHz

Anthony S. Hu
New Mexico State University
Las Cruces, New Mexico

Mobile communication link through electromagnetically obstructed areas can be established by using wayside leaky coaxial cables. Available experimental data had been limited to 450 MHz. This paper presents the result of a recent experiment of the RADIAX cable at 900 MHz in near field. These data are used to supplement an earlier RADIAX experiment at below 450 MHz and to compare with a theoretical study at 1 GHz.

* * *

Channel Utilization by Remote Locomotive Control Systems Using Digital Transmission

H. L. Massie
The Atchison, Topeka and Santa Fe Railway Company
Chicago, Illinois

The railroad industry is successfully operating, co-channel, several radio-controlled remote locomotive systems (slave locomotives) and cab signalling systems within radio range of each other through the use of high security digital transmission. The railroad service now has two pair of 450 MHz frequencies assigned nationwide for these systems. This paper will describe the extent these systems are presently being used and the methods employed to avoid inter-system interference while permitting sufficient air time to provide "real time" control and signalling to locomotives.

* * *

Public Mobile Telephone - A Comparative Analysis of Systems Worldwide

R. L. Lagace
H. L. Pastan
Arthur D. Little, Inc.
Cambridge, Massachusetts

Public mobile telephone systems available throughout the world exhibit a broad range of radio communications technology and sophistication of subscriber service. Results of detailed comparative analysis of systems worldwide are presented. The comparisons encompass key technical performance and operational characteristics on overall system and mobile unit levels; mobile unit costs; status of evolutionary development in selected countries regarding degree of automation, numbers of subscribers and geographic availability of service; and major developments anticipated in service upgrading and expansion.

* * *

A Controller for the Mobile Logic Unit in the BTL High Capacity Mobile Telecommunications System

M. R. Karim
Bell Laboratories
Whippany, New Jersey

In the BTL-developed High Capacity Mobile Telecommunications System, a digital controller allows mobiles to communicate with Cell Sites by means of a high-speed data link, and interacts with the user via switches and displays. This paper presents an overview of the controller. The switching and control functions that it performs and digital messages involved are first briefly described. This is followed by a description of its hardware design that uses a microprocessor as its central processing unit.

* * *

An Approach to Digital Signal Processing For A High Capacity Mobile Telephone System

E. J. Addeo
Bell Laboratories
Whippany, New Jersey

The High Capacity Mobile Telephone Communications System (HCMTS) employs a 20K baud digital signaling system to provide information needed in the various stages of call setup and control. This paper describes the signal processing required for transmission and recovery of this digital information over the Rayleigh fading channel environment. An overview of the mobile data recovery system along with a discussion of spectrum considerations is given. Also, laboratory data taken with a Rayleigh fading simulator and results from field testing are given.

* * *

Mobile Radio Signal Correlation Versus Antenna Height and Spacing

W. C. Y. Lee
Bell Laboratories
Whippany, New Jersey

A given correlation value between two signals received at a mobile base station can be achieved by adjusting the antenna spacing and height; this has been experimentally verified. From this fact, a new parameter η , defined as

$$\eta = \frac{\text{antenna height}}{\text{antenna spacing}}$$

is proposed.

From this η -p plot, an upper bound correlation coefficient for any η can be found. This upper bound value is useful for system design.

* * *

Radio Wave Loss Deviation and Shadow Loss at 900 MHz

Neal H. Shepherd
General Electric Company
Lynchburg, Virginia

Radio wave propagation between base and mobile stations is normally described as being Rayleigh distributed due to multipath interference. When the multipath is made up of a limited number of radio waves, the variations in signal amplitude follows a Weibull distribution. The transmission loss deviation has been defined as the dB difference between the 50 and 90% points on the Weibull distribution. Data will be presented showing loss deviation between 3 dB and 30 dB.

Shadow loss over hills and around buildings are usually assumed to be knife-edge or rounded knife-edge. Shadow loss based on these assumptions is generally found to be less than the true measured value. Data will be presented comparing calculated shadow loss with measured values.

* * *

Emergency Medical Services Communication Systems

A. J. J. Sluyter
General Electric Company
Lynchburg, Virginia

This paper discusses Emergency Medical Service Systems with a primary emphasis on Land Mobile communication systems. The basic purpose of EMS systems and the applicable FCC Rules and Regulations are reviewed. Descriptions of several communication systems follow including how the various systems address some of the common EMS requirements and problem areas.

* * *

Voice Communications in a Rapid Transit Tunnel Environment

Joseph P. Greenway
Washington Metropolitan Transit Authority
Washington, D.C.

This paper will describe in detail the design, installation and operation of a multi-frequency rapid transit radio system utilized by the Washington Metropolitan Area Transit Authority. It will contain discussions of the operational constraints, civil construction considerations and technical engineering detail that has gone into the implementation of the system. It will also touch briefly on those elements that might be changed or modified in light of actual operating experience.

* * *

The Technology of Fare Collection in Use by WMATA

Paul C. Johnson
Washington Metropolitan Area Transit Authority
Washington, D.C.

Concise descriptions of three systems are given:

1. The pneumatic revenue-collection system for Metrobus
2. The automatic fare collection system for Metrorail
3. A hoped-for Intermodal Automatic Fare Collection System which will permit use of the Metrorail magnetically-stripped Farecard on Metrobus

Emphasis is placed on the technology involved in each of these systems.

* * *

A Comprehensive Automatic Mobile Radio-Telephone System

Edward G. Frost
Frost Communications, Inc.
Rockville, Maryland

The paper describes a fully automatic mobile radio-telephone system interconnected with the land telephone switching network. Automatic transfer of communications from one base station to another for mobiles in motion and automatic call metering and ticketing are described in detail. The use of out-of-band data signalling common to all channels in the system is described and discussed as a means of optimizing channel usage for communications.

* * *

A Continuous Longitudinal Control Signal Via The Low Frequency Excitation of Helical Transmission Lines

Robert J. Mayhan
The Ohio State University
Columbus, Ohio

A method of generating a continuous position reference signal for use in the longitudinal control of automated ground transport systems is presented. The technique utilizes two specially excited four-wire helically wound transmission lines. The method of excitation, the signal detection and processing schemes necessary to obtain the control signal, and the results of preliminary laboratory tests are presented. The technique should provide a highly accurate, easily implementable and environmentally impervious means of generating a longitudinal reference signal.

* * *

Equipment for an Automatic Transmitter Identification System (ATIS)

Chandos A. Rypinski
Rydax, Inc.
San Rafael, California

Increased use of radio channels is possible if fraction-of-a-second data messages are used to replace voice identification now used operationally and to satisfy FCC procedural rules.

Recently developed equipment for the ATIS function is simple, reliable and low cost, so that it can be considered for universal use. The modulation, coding and circuit design technique used will be described as well as some applications and experimental results.

This work will be related to universal ATIS as explored in FCC Docket No. 20351, and comments will be offered on maximization of user benefits which might result from adoption of appropriate ATIS technical standards.

* * *

Improving Spectrum Utilization in Mobile Radio Communications

Henry Magnuski
Consultant
Glenview, Illinois

Spectrum is a multidimensional quantity. Considering this, AM, SSB, FM and digital modulation are compared for best spectrum utilization.

The evils of high transmitter power are enumerated and some system configurations using low power are discussed. In particular, Prearranged Communication Path (PCP) systems using chains of low power repeaters are described.

Looking into the future, it is predicted that PCP Systems using Delta Modulation will be widely used, providing improved service with privacy and much better spectrum utilization.

* * *

LSI For Continuous Tone-Controlled Squelch Systems

Richard F. Challen
William A. Bowen
General Electric Company
Lynchburg, Virginia

Large scale integration (LSI) of electrical circuitry into monolithic integrated circuits is one of the most effective means of obtaining low cost and high reliability. This paper discusses the results of applying this technology to a CTCSS. Descriptions of a crystal-controlled tone encoder and a tone decoder utilizing a digital filter are included.

* * *

Arizona's Emergency Medical Communications System

Bernard Flood
Arizona Department of Public Safety
Phoenix, Arizona

The Arizona Demonstration Emergency Medical Service Communication System has two major components: an alerting system using portable radio equipment supplied to truckers traversing the state, and; a UHF channel that provides voice communications between ambulances, hospitals and emergency care centers, DTS dispatchers and participating doctors.

Large geographic distances to be covered, coupled with low population densities, created EMS communications system design problems not normally encountered in more populated areas. Techniques, such as receiver voting, automatic transmitter selection, and special control console design were major considerations in the system development.

* * *

Design of a Comprehensive State Police Radio System

Lewis L. Taylor
Bernard Johnson, Inc.
Houston, Texas

This paper describes the process being used to develop and implement a state-wide radio communications system for the Louisiana State Police. The Louisiana State Police has been dependent for all of their radio communications, on two low-band frequencies, which are limited by interference, congestion, and poor geographical coverage. This system is being replaced by the new VHF high-band and UHF multi-frequency system which provides an individual frequency channel for each of the 11 troops in the state, separate tactical working channels and administrative channels, digital status messages, automatic identification, discreet address, vehicular relay and other features. The new system includes 29 mobile relay stations, 12 simplex base stations, 11 control stations, and over 1200 mobile units.

The developmental steps were defined clearly and are described in this paper. The methodology used in developing the system is applicable to developing other large-scale law enforcement command and control systems.

* * *

Applications of a Computer-Controlled Terminal To Mobile Telephone Communication Systems

Wilson T. Outlaw
Martin Marietta Aerospace
Orlando, Florida

Increasing requirements for flexibility in control of automatic-dial mobile telephone systems led to the development of a computer-controlled terminal for use with both new and existing systems. This terminal is designed to be the nucleus from which a total systems approach to mobile telephone communication systems can be offered. New capabilities included as a result of requirements analysis include: the collection of billing and traffic statistics data, the inclusion in the control terminal of automatic self-testing and diagnostics, adaptability to control various multiple RF coverage configurations, and the virtual elimination of requirements for operator service.

* * *

On the Longitudinal Control of Automated Ground Vehicles

G. M. Takasaki
R. E. Fenton
Ohio State University
Columbus, Ohio

The achievement of safe and efficient longitudinal control is probably the most significant technical problem associated with individual automated-vehicle transport systems such as PRT, dual-mode, and the automatic highway. Several aspects of such control are of concern here: The specification of a realistic model of vehicle longitudinal dynamics; the use of those dynamics in the design of a vehicle controller to meet specifications typical of those for future systems; and the implementation and full-scale testing of the designed controller.

* * *

The Outlook for U.S. Air-Ground Public Radio Telephone Services

C. A. Bean
E. A. Grabhorn
Arthur D. Little, Inc.
Cambridge, Mass.

This paper examines the history of air-ground public radio telephone services (AGPRT) and various factors that inhibited more rapid growth in the civil air carrier and general aviation fields. It also reviews past frequency assignments where congestion has occurred that tended to discourage more widespread use of this service.

With a population of some 65,000 business aircraft anticipated by 1985, tremendous growth in AGPRT can be foreseen. The paper reviews the status of active and pending ground station licenses, the amount of present and projected traffic through typical ground stations and the products and plans of both equipment manufacturers and service companies in the field.

* * *

Multipath and Ducting Tolerant Location Techniques For Automatic Vehicle Location Systems

David L. Nicholson
United States Naval Academy
Annapolis, Maryland

It is common when using Time Difference of Arrival (TDOA) hyperbolic location techniques to avoid the time consuming, simultaneous solution of the non-linear equations inherent to these techniques by linearizing the location geometry. The linearization is of the geometry and not of the mathematical solution of the non-linear equations. As a consequence, the resulting solution technique, although linear in the unknown location variables, is very sensitive to large, but commonly occurring, propagation errors in the urban environment. Based on actual data, this paper describes the performance of several linear least squares solution algorithms which reduce the sensitivity of the linearizing assumption to multipath and ducting errors.

* * *

CALENDAR OF BICENTENNIAL EXHIBITS AND MAJOR FESTIVALS

IN WASHINGTON, D.C. -- 1976

National Archives--7th St. and Constitution Ave., N.W.
963-6404--

The permanent residence of the famous documents upon which our government was established--The Declaration of Independence, the Constitution and the Bill of Rights. Free.

Library of Congress--1st St. and Independence Ave., S.E., 426-5000--

This great house of books offers a major exhibit called "To Set A Country Free" documenting the chain of events from the beginning of revolutionary fervor to the Treaty of Peace in 1783. Free.

Museum of History and Technology--12th and Constitution Ave., N.W., 628-4422--

"Of the People, By the People and For the People." The definitive exhibit on American government explores such subjects as the first census, campaign practices past and present, trends in civil rights and the women's suffrage movement. Free.

National Rifle Association--16th and Rhode Island Ave., N.W., 783-6505--

The NRA's free museum unfolds the drama of the American Revolution with a wide range of firearms, uniforms and accoutrements used in the latter half of the eighteenth century. Free.

Truxtun-Decatur Naval Museum--1610 H St., N.W., 783-2573--

The role of the Navy in the development of the U.S. as a world power is the subject of a free and enlightening exhibit in this quaint museum near the White House.

The Navy Memorial Museum--In the Washington Navy Yard, 9th and M Sts., S.E., 433-2651--

Join in the Navy's 200th anniversary celebration by visiting the Navy Yard, one of the oldest sections of Washington. The museum, one of the largest in the Washington area, offers a tremendous overview of Naval history. Unique features include a working submarine periscope, a Japanese midget submarine and a set of 5-inch naval guns that can be operated by visitors. Free.

National Portrait Gallery--8th and F Sts., N.W., 628-4422--

"The Dye is Now Cast, 1774-1776" covers the chain of events from the Battles of Lexington and Concord to the adoption of the Declaration of Independence. Free.

The John F. Kennedy Center for the Performing Arts--Rock Creek Parkway at the end of New Hampshire Ave., N.W., 872-0466--

"America on Stage," the largest exhibit ever produced at the Kennedy Center, presents the history of America's theater, dance, music and other entertainment themes from colonial days up to the present. This is a free exhibit and well worth the visit.

National Gallery of Art--6th and Constitution Ave., N.W., 737-4215--

"The European Vision of America" demonstrates the development of the visual image of the Americas in the minds of European artists and craftsmen.

Freer Gallery of Art--12th and Jefferson Dr., S.W., 628-4422--

"The Arts of Asia" explores the world of Near and Far Eastern art trends during the late 18th century and provides a manner in which to compare American art with that of another culture.

Anacostia Neighborhood Museum--

An exhibit called "The Black Woman" offers an important insight into the history of the Black woman's plight from slavery to the present.

The Octagon--18th and New York Ave., N.W., 628-3105--

The original drawings in the competition for the design of the Capitol building will be on display to the public for the first time in this free exhibit.

Museum of Natural History--10th and Constitution Ave., N.W., 628-4422--

"Our Changing Land" shows the impact of man on his land and the changes that have occurred during the past 200 years. Free.

Renwick Gallery--17th and Pennsylvania Ave., N.W., 628-4422--

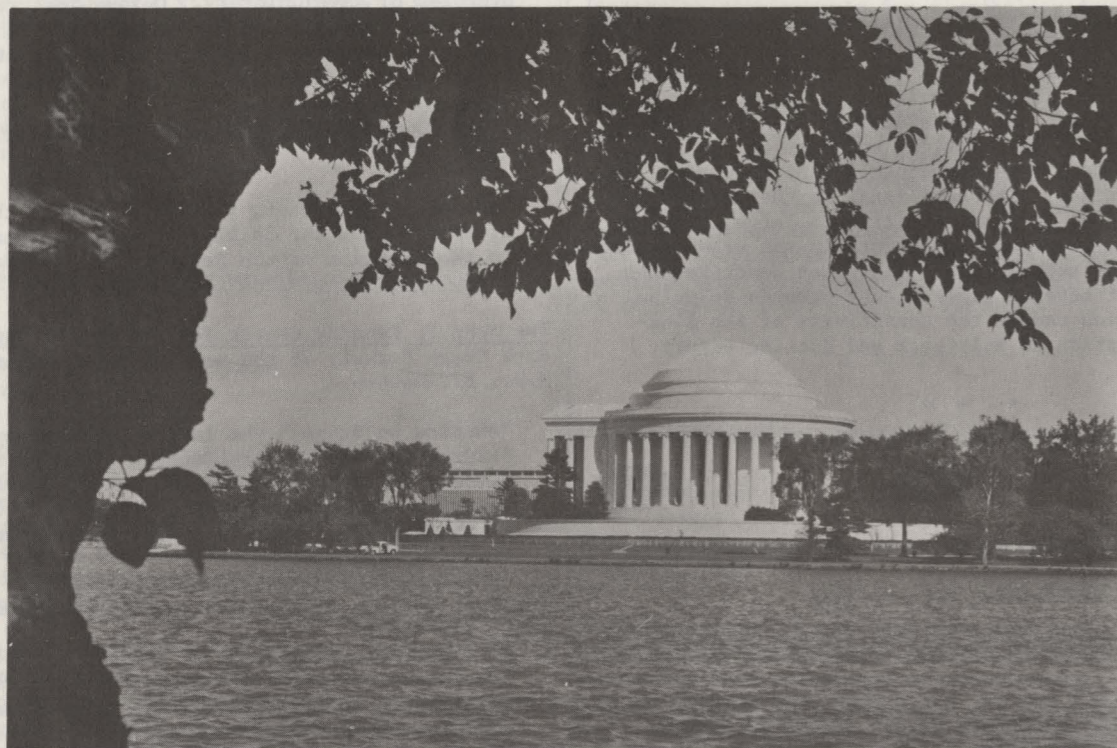
"Signs of Life: Symbols in the City," illustrates the rich diversity of symbols and signs which have existed in cities through time and continue today in our urban environment. Free.

Great Hall of the Smithsonian Institution--10th St. and Jefferson Dr., S.W., 628-4422--

"The Federal City" Plans and Realities," focuses on the architectural and planning history of the National Mall area from 1776 to the present. Free.

Museum of History and Technology--12th and Constitution Ave., N.W., 628-4422--

"A Nation of Nations," the Smithsonian's largest exhibit ever, will depict the settlement of America and the resulting formation of a new society comprised of cultures and traditions from all over the world. Free.



JEFFERSON MEMORIAL, WASHINGTON, D.C. - Considered by many to be the most beautiful structure in the nation's capital, the Jefferson Memorial is situated on the Tidal Basin. In springtime the memorial is surrounded by a blaze of cherry blossoms. Photo courtesy Washington Area Convention and Visitors Bureau.

OCEAN ENGINEERING

In our last newsletter, Nick Alimpich reported that the Adcom has decided to continue its activity and support of the Council on Ocean Engineering. Our representatives to the Council are George McClure and Robert Cassis.

Nick also reported that George is attempting to assemble a Special Issue of the Transactions on marine radio. Our interest in the OCE includes marine communications and this special issue could be very beneficial to other Council members. If you are involved in marine communications, please consider submitting a paper to George. You might also consider presenting the paper at one of the VTG or OCE conferences, which brings me to the next topic.

The OCE sponsors two annual conferences, the Offshore Technology Conference in Houston, which this year will be held May 3-6, and the Ocean series conference, which this year will be held in Washington, D.C. on September 13-15.

The VTG receives a portion of the surplus funds of the OCE based upon conference attendance, conference support on committees, OCE Journal readership and

support of the OCE by VTG representatives and Adcom. You can help by ensuring you identify yourself as a member of IEEE, in addition to any other societies you represent when you register for conferences, by submitting papers at conferences and for the Journal, and by working on conference and Journal committees.

The call for papers has been issued for Ocean '76. Categories of interest to you include communications, navigation, oceanographic ships, power systems, transportation systems and undersea vehicles. In many of these and other areas, some of the non-marine work being performed in the area of vehicular technology could apply. I'm particularly interested in organizing a session on marine communications or navigation.

Finally, you may have noticed on your membership renewal form that a new journal Oceanic Engineering is being offered to you for only \$4.00 per year. This quarterly publication should be packed with interesting information for any engineer, but particularly one working in the challenging and difficult ocean environment. I recommend you try this journal this year.



The Institute of Electrical and Electronics Engineers, Inc.

TWENTY SIXTH VEHICULAR TECHNOLOGY CONFERENCE

March 24-26, 1976
The Statler Hilton
Washington, D. C.

PRE-REGISTRATION APPLICATION

From: _____ Date _____

Last Name First Name Initial

Address _____

City State Zip

Title Company/Agency

Area Code Telephone No. Extension

To: Registration Chairman, 26th Vehicular Conference. My check for the sum of \$ _____ (made payable to "1976 Vehicular Technology Conference" is enclosed for the items checked off below.

| | | |
|--|---------|--------|
| IEEE Member Registration for Technical Sessions, Copy of Conference Record and Exhibit Area. (\$25.00 at the door) | \$20.00 | _____ |
| Same as above for <u>NON</u> -IEEE Member (\$30.00 at the door) | \$25.00 | _____ |
| Thursday Luncheon to holder of above (\$10.00 at the door) | \$ 7.50 | _____* |
| Thursday Luncheon for Non-Registrants (\$15.00 at the door) | \$12.50 | _____ |
| Friday Luncheon for Registrants (\$10.00 at the door) | \$ 7.50 | _____* |
| Friday Luncheon for Non-Registrants (\$15.00 at the door) | \$12.50 | _____ |
| Exhibit Area Pass (for non-registrants). Good any day. | \$ 5.00 | _____ |

You may also order the following tickets at this time and include the cost of same in your check.

| | | |
|--|---------|-------|
| Wednesday NABER Senior Communications Symposium (does not include meal) | \$ 7.50 | _____ |
| Wednesday Evening ARRL Technical Symposium (includes copies of papers delivered) \$3.50 at the door. | \$ 3.00 | _____ |
| Thursday Evening Radio Club of America Semi-Annual Banquet (\$20.00 at the door - if space is available) | \$17.50 | _____ |
| TOTAL OF ABOVE. | \$ | _____ |

Make check payable to "1976 Vehicular Technology Conference" and mail to Registration Chairman:

Mark Crosby
C/O SIRSA
1901 N. Moore St. (Suite 602)
Arlington, Virginia 22209

*Only one Thursday and one Friday Luncheon Ticket at \$7.50 each per individual registration. Extra tickets will be \$12.50 in advance or \$15.00 at the door.

Please send me information on activities for women. _____

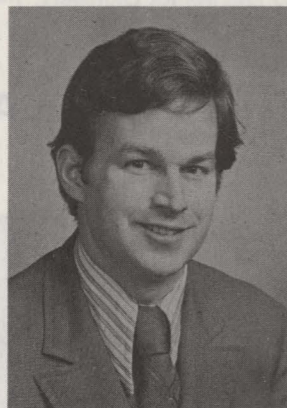
The Expanding World of Vehicular Technology -- Land...Sea...Air...Space

AUTOMOTIVE ELECTRONICS

DATELINE: DETROIT

By BILL FLEMING

AUTOMOTIVE ELECTRONICS EDITOR



PREPARATIONS STARTED FOR CONVERGENCE '76

Arrangements are underway for Convergence '76, a symposium devoted exclusively to automotive electronics. If it matches last year's meeting of Convergence '74, more than 700 people representing most industrial countries of the world will attend. This year's meeting will be held in Dearborn, Michigan at the new Hyatt Regency Hotel on September 20-22, 1976.

The official title is: "Convergence '76, Automotive Electronics and Electrical Vehicle Symposium." It is sponsored by the National Automotive Electronics Committee of the Vehicular Technology Group of IEEE. Cosponsors include: SAE, Electric Vehicle Council, and IEE. Special attention this year will be given to the development status of electric vehicles, on-board microprocessors used for engine control, and emerging energy technologies. There will be five technical sessions, and approximately 25 invited speakers who are chosen to represent many of the major electronics companies from worldwide locations.

The prime movers and organizers of this year's meeting are Trevor Jones of General Motors, Joe Ziomek of Ford, Ted Schaller of Allen-Bradley, Olie McCarter of General Motors, Dale Grimes of the University of Michigan, and Earl Meyer of Chrysler.

CALL FOR REVIEW ARTICLES

The editor of this newsletter, Olin Giles, repeatedly asks if someone might wish to write a review article on some aspect of automotive electronics. I hereby extend this invitation to our readers--"If there is anybody out there at, for example, Bendix, Motorola, Rockwell, etc., who is interested in this, give me a call in Warren, Michigan at 313-575-2849, and I'll get you started."

AUTOMOTIVE ELECTRONICS NEWSLINE

I thought it would be of interest to briefly comment on current news items on the subject of automotive electronics. During the past year I've noted that of all the published news items on automotive electronics, I would estimate the following breakdown according to topic.

1. About 35% of news items have described newly available electronic controls for spark timing and fuel injection systems.

2. About 20% of news items have described electronic anti-skid braking systems, which were recently mandated on heavy trucks.
3. About 15% of news items have described new electric vehicles.
4. About 10% of news items have described new instrumentation developed for vehicular diagnostics.
5. The remaining 20% of news items have described a variety of topics ranging from IC tuners for auto radios to special telemetry measurements of racing-car performance.

The three biggest developments during the past year were the Bendix electronic fuel injection (EFI) system, the Chrysler "lean burn" electronic spark timing system, and the Ford computer controlled spark timing (CCT) system.

"INSIDE THE ENGINE CYLINDER"

A meeting titled, "Inside the Engine Cylinder" was sponsored by the S.E. Michigan chapter of VTG and was held December 3, 1975 in Dearborn, Michigan at the Ford Motor Company Scientific Laboratory. The meeting was organized by Bill Fleming of General Motors and Bob Terhune of Ford. The meeting program was quite interesting and I thought it would be worthwhile to highlight the technical proceedings.

Over the past decade, some novel electronic methods have been developed to investigate the physical mechanisms of emissions formation and combustion characteristics which take place in the engine cylinder. A special program was arranged to review this work, and selected topics were discussed by three invited speakers.

•Ed Caryl of Tektronix Analytical Instruments Group (Beaverton, Oregon) described how a rapid-scan spectrometer, combined with a digital processing oscilloscope, is used to measure and display spectral properties of the combustion taking place in the cylinder of an automobile. This instrument is used for two purposes: (1) to identify chemical species and measure their concentrations as a function of time, and (2) to detect presence of foreign chemical species such as oils or particulates in order to locate engine design faults.

A commercially available spark plug was used which had a transparent insulator through which the optical spectra (300 to 1100 nm wavelengths) of the combustion flame was observed. The light was transmitted to the spectrometer by means of fiber optics. The instrument has been used with a CFR single-cylinder engine, a motorcycle engine, and a diesel engine. There has been success in detection of the following exhaust gases: OH, H₂O, NO, CO, and CH₂O.

•Angelo Merlo of DI-AG Nostic Instrument Res. (Sterling Heights, Michigan) described how S-Band microwave signals are transmitted into an operating engine cylinder chamber by using the spark plug as a coaxial feedthrough entry point. He privately funded this work over a seven-year period and has made some interesting measurements. By matching the resonant mode of the microwave signal inside the cylinder to a particular piston position, he is able to measure the microwave absorption characteristics at a precisely determined crank angle. The absorption measurements give information on piston ring seal flutter, flame propagation, misfire, and the relative phasing of combustion events and valve motion as a precise function of crank angle.

The instrument has been used on three different automotive IC engines. Angelo showed how, when the spark plug cable was disconnected, a given resonance would sharpen up due to the absence of flame inside the cylinder. Ionized gases in the flame tend to be lossy and absorb the microwave signal, thereby broadening the resonance whenever the flame was present. He also showed evidence of detection of microwave radiation arising from plasma-frequency subharmonic oscillations inside the combustion flame. Other details on his work can be found in his paper, "Combustion Chamber Investigations by Means of Microwave Resonances," *IEEE Trans. Industrial Electronics and Control Instrum. IECI-17*, No. 2, April 1970; pp. 60-66.

•Bill Rado of Ford Scientific Research Staff (Dearborn, Michigan) described the use of a spark plug as a plasma probe to monitor the combustion quality inside an engine cylinder. A special electronic circuit, which connects to the existing spark plug cable, was designed to apply a 300V bias to the non-firing spark plug gap. Due to flame induced ionization of gases inside the cylinder, the conductivity across the plug gap is very high during the combustion process and a misfire can be detected. A signal processing circuit automatically displays the percentage of misfire occurrence. This signal has proven useful in the optimization of engine performance, particularly when the constraints of pollution control must be satisfied.

The instrument is designed to detect three types of combustion events--good burns, slow burns, and misfires. Slow burns were evidenced by the existence of flame ionization current during the exhaust stroke of the engine cylinder. Bill showed some remarkably nice data which demonstrated strong correlation between the incidence of slow burn and misfire events and the emission level of hydrocarbons. Three cases were shown: (1) effect of increasing exhaust gas recirculation, (2) effect of increasingly lean air-fuel ratio, and (3) effect of cold engine startups. Further detail on this instrument is found in the articles: "Monitoring the Combustion Quality in Internal Combustion Engines Using the Spark Plug as a Plasma Probe," *IEEE Trans. Vehic. Tech. VT-24*, No. 2, May 1975, pp.17-21; and "Characteristics of a Plasma Generated by Combustion in a Spark Ignition Engine," *J. Applied Physics*, 46, No. 6, June 1975, pp. 2468-2474.



Speakers at the December 3, 1975 Meeting of the S.E. Michigan Chapter of VTG on "Inside the Engine Cylinder." From left to right: Bill Rado of Ford, Angelo Merlo of DI-AG Nostic, and Ed Caryl of Tektronix.



Part of the audience at December 3, 1975 Meeting, "Inside the Engine Cylinder" -- 32 people attended.

THE WASHINGTON SCENE

By ERIC SCHIMMEL

WASHINGTON NEWS EDITOR

DIGITAL STUDY

At this writing, the FCC is about to hold a bid opening on its request for quotations for the performance of a study to "examine ways to utilize digital techniques in the Private Land Mobile Radio Services, to determine the needs for digital operations in these services, and to investigate the requirements for standards." The results of this study, which has a reported budget of about \$50,000 and is due for completion in nine months, will be used by the Commission in determining the need and scope of new rules and regulations in this area.

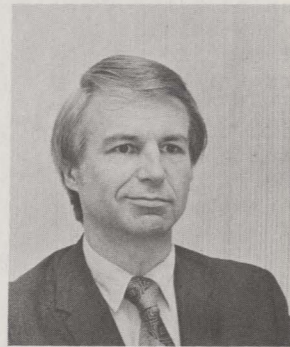
Digital techniques have, of course, been utilized for many years in various special land mobile applications, including telemetry and selective calling. More recently, digital techniques have been employed to automate and replace routine voice communications. A prime issue to be addressed in the proposed study is whether digital transmissions are more efficient than voice for certain applications, and would contribute to a more effective use of the crowded land mobile radio spectrum. If this basic question is resolved in the affirmative, it will then become necessary to deal with the less easily resolvable issues of technique and technical standards. In other words, in circumstances where standardization is determined to be necessary for reasons of compatibility, such as with a mandatory automatic transmitter identification requirement, someone will have to decide on the functional parameters to which all equipment manufacturers will have to adhere, regardless of their proprietary preferences.

Clearly, the successful bidder for this study contract will have a rare opportunity to influence the mobile radio industry of the future. With this opportunity, however, goes a sobering responsibility which we hope will be taken aggressively but prudently.

AN ATTEMPT AT DEREGULATION

The term deregulation is being heard with increasing frequency on the Washington scene. It usually connotes an expression of advocacy for more self regulation by business and industry, and acknowledges that governmental regulation has indeed become excessive. Some of this advocacy comes from within government itself including Congress and the White House.

Now, a manifestation of this doctrine has emerged, no less, from the FCC itself. In issuing a Notice of Proposed Rulemaking in Docket 20665, the Safety and Special Radio Services Bureau has indicated its willingness to eliminate from its regulations, the traditional requirement for licensees to have test measurements



made on all transmitters annually. These measurements include frequency, modulation and power.

At first blush, most licensees say, hooray! Underlying this jubilation, however, is a cautious skepticism by some system managers, that the relaxation of these rules may in fact result in the degradation of systems which are not administered with equal integrity. Notwithstanding that licensees will still be responsible for maintaining their systems to authorized technical standards, there is concern that in the absence of annual "preventative maintenance" requirements, interference to innocent co- and adjacent channel systems may escalate.

Formal comments will have been filed in this proceeding by the time this article is in print, but which side do you take?

VEHICULAR IGNITION PROCEEDING

Over the years, much attention has been given to spark ignition systems as a major source of interference to mobile radio communications. Suppression equipment for the vehicles and innovative noise blankers for the radios have all made a contribution toward the goal of eliminating this mode of destructive interference. Recent migration of land mobile systems into new and less susceptible UHF territory has de-emphasized this problem. Nonetheless, the FCC has issued a Notice of Inquiry in Docket 20654 to solicit comments on the subject.

This action is being taken, at least partially, as a result of questions raised by a recent study performed by Stanford Research Institute under contract to the FCC. These questions are outlined below and require response to the Commission by March 19. Also of interest is the statement of Commissioner Reid in concurrence with the issuance of this proceeding.

1. To what extent are other kinds of radio services such as television, microwave and amateur degraded by ignition interference?
2. To what extent is land-mobile reception degraded by ignition interference?
3. To what extent is radio reception degraded by motor vehicles that comply with the ASE J551 standard with respect to:
 - a. individual vehicles
 - b. simultaneous operation of groups of vehicles

4. To what extent do automobiles, trucks, and motorcycles comply with the SAE J551 standard?

5. Do automotive vehicle manufacturers comply with the sampling requirements of the SAE J551 standard?

6. To what extent are resistance type ignition cables and resistance type spark plugs removed from motor vehicles and replaced with solid wire cables and non-resistance spark plugs? What reports exist that describe the increased interference effects that result from this practice?

7. Are ignition cables available that are effective in suppressing radiation but do not suffer the adverse effects of high engine temperature?

8. What extent do imported cars comply with the present voluntary SAE standards?

9. What information is available to support or refute the SRI findings?

10. What would be the additional cost to the consumer in applying the suppression techniques developed by SRI?

11. What are the cost benefit considerations in reducing ignition radiation from its present base using SRI or other techniques?

12. What future developments can be expected in automotive design that will increase or decrease ignition radiation?

13. What alternatives exist for alleviating ignition radiation other than suppression at the source?

14. What are the cost-benefit considerations of these alternatives?

CONCURRING STATEMENT OF COMMISSIONER CHARLOTTE T. REID

I am very concerned over several aspects of this proceeding. Obviously we are lacking the necessary information to determine what standards or rules, if any, should be imposed on vehicle ignition systems. A Notice of Inquiry is the best method available to the Commission to obtain the necessary data on which to base a decision and totally support that effort.

However, I always hesitate when the Federal Government is about to add another layer of regulation to the existing pile of bureaucratic red tape. The Society of Automotive Engineers has an existing standard with which industry has complied voluntarily. If the noise level restrictions imposed by that standard are not sufficient, then I would urge industry to correct the deficiencies and avoid Federal intervention.

My other concern is simply that if information received from this Notice of Inquiry bears out the suspicion that a serious problem exists, and industry fails to respond accordingly, the Commission will be left with a tremendous regulatory task to accomplish and, if recent budget cuts are any indication, few resources with which to work. If that is the case, we may be forced to delay any ignition noise suppression program or proceed at the expense of some other existing Commission endeavor.

BOOK REVIEWS

By CARROLL LINDHOLM

BOOK REVIEW EDITOR

Here is another IEEE Press publication of great interest to members of the Vehicular Technology Group.

Frequency Synthesis: Techniques & Applications
Edited by Jerzy Gorski-Popiel. IEEE Press (N.Y.), 1975

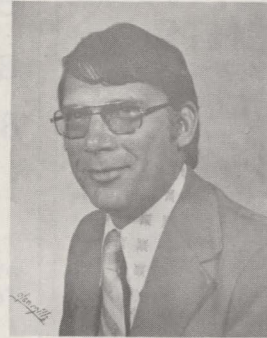
This volume is a collection of six papers exploring the theory and applications of frequency synthesizers. Beginning with an introductory chapter by T.S. Seay which surveys the many applications to which the synthesizer is put, the succeeding chapters go on to discuss specific techniques of design including some very specific design efforts concentrating on tackling the specific problems which arose. The latter chapters are not reviews or encyclopedic studies of their subject matter, but rather chronicle a single project whose specific goals are listed.

The book concentrates on state-of-the-art aspects of design with only a cursory look at economical constraints. Thus, if you are looking for a dandy new scanner receiver design to sell in the popular electronics market place, you would do well to read QST, CQ or 73 Magazine where economical designs are reviewed. But, if you have just been presented with a project to design something for a fancy new application where money is no object, there is useful material to be found here. Numerous references guide the reader to the literature. It remains true that many of the techniques discussed depend on current technology and thus are already dated.

In summary, I would not recommend this book as an introduction to synthesizers, but rather as a review of current topics on the subject.

CHAPTER NEWS

By JOHN DETTRA
CHAPTER NEWS EDITOR



MEETINGS

- CHICAGO: "THE CHICAGO POLICE DEPARTMENT MOBILE DATA TERMINAL"
BY TOM SIKORA, CHICAGO POLICE DEPARTMENT, ON OCTOBER 23, 15 ATTENDING.
- "LIVING WITH LIGHTING"
BY KEN GUTHRIE, GENERAL ELECTRIC CO., ON NOVEMBER 12, 17 ATTENDING.
- CLEVELAND: "COMPLEX MESSAGE SWITCHING SYSTEM"
BY STEVE ROUGH, KUSTOM DATA COMMUNICATIONS, ON OCTOBER 14, 31 ATTENDING.
- COLUMBUS: "PHASE LOCK LOOP TECHNOLOGY IN MOBILE RADIO"
BY BILL CHRISS, OHIO BELL TELEPHONE CO., ON NOVEMBER 12, 14 ATTENDING.
- "SUBSURFACE ELECTROMAGNETIC PULSE RADAR"
BY DR. DAVID L. MOFFATT, OHIO STATE UNIVERSITY, ON DECEMBER 10, 11 ATTENDING.
- MICHIGAN, SE: 'LOW COST RADIO CONTROLS' ON OCTOBER 16, 32 ATTENDING
"OVERVIEW OF RADIO CONTROL APPLICATIONS"
BY GUS UNDY, PRESIDENT OF MULTI-ELMAC
"ENGINEERING DESIGN OF LOW-COST RADIO CONTROL SYSTEMS"
BY KEN UMPLEBY, CHIEF ENGINEER OF MULTI-ELMAC
"METHODS FOR MANUFACTURING LOW-COST RADIO CONTROLS"
BY BOB LELAND, PRODUCTION MGR. OF MULTI-ELMAC
- "OVERVIEW OF GMR SEMICONDUCTOR RESEARCH"
BY DR. MARTING C. STEELE, GMR SEMICONDUCTOR, ON NOVEMBER 19, 39 ATTENDING.
- PITTSBURGH: "THE FCC-HOW IT WORKS LOCALLY"
BY JOHN THEIMER, FCC, ENGINEER IN CHARGE, ON DECEMBER 11, 45 ATTENDING.
- "LIVING WITH LIGHTING"
BY KEN GUTHRIE, GENERAL ELECTRIC CO., ON OCTOBER 15, 27 ATTENDING.
- SACRAMENTO: TOUR OF PG & E RESEARCH FACILITY AT SAN RAMON, CALIFORNIA
ON OCTOBER 11, 24 ATTENDING.
- WASHINGTON: "THE CHICAGO DEVELOPMENTAL 900 MHZ CELLULAR MOBILE RADIO"SYSTEM"
BY ROBERT L. MATTINGLY, BELL LABORATORIES, INC.
ON OCTOBER 10, 58 ATTENDING.
- "TRENDS AND CHALLENGES IN LAND MOBILE RADIO"
BY CLIFFORD A. BEAN, ARTHUR D. LITTLE, INC. ON DECEMBER 12, 38 ATTENDING.

NEW CHAPTER OFFICERS

- | | | | |
|---------------|--|---------------|---|
| SACRAMENTO: | MAYNARD A. WRIGHT, CH. JOHN W. MAIER, V. CH. PETER J. DUGAL, JR., SEC. | CLEVELAND: | STEVEN F. LUX, CH. KARL F. BECKMAN, SEC. |
| MICHIGAN, SE: | WILLIAM H. FLEMING, CH. VERNE CARON, V. CH. JAMES M. LEAHY, SEC. | NEW YORK: | HARRY G. BOYLE, CH. |
| | | COLUMBUS: | ROBERT J. MAYHAN, CH. |
| | | PHILADELPHIA: | THOMAS SORBER, CH. |

ADCOM HIGHLIGHTS

ADCOM NEWS EDITOR

By TOM McKEE

DECEMBER MEETING

The winter meeting of the VTG Adcom was held on December 3, 1975 at the Fairmont Hotel in New Orleans, La.

* * *

The following persons were present:

Nick Alimpich
Jack Barkle (Part-time)
John Cassidy
Martin Cooper
Dick Emberson (Part-time)
Olin Giles
Dave Howarth
Same Lane
Fred Link
Chuck Lynk (representing A. Brenner)
Roger Madden
George McClure
Sam McConoughey
Tom McKee
Stuart Meyer
Neal Shepherd
Dave Talley (quest-former member)

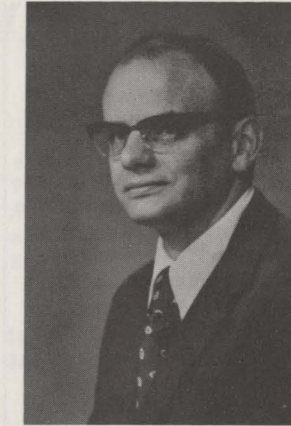
The following elected Adcom members were unable to attend the meeting:

Carl Brooks
Dick Moore
Jack Renner
Jack Neubauer

* * *

VTG officers were elected for 1976. Same Lane was elected President, moving up from Vice President. John Cassidy, who has been serving as Treasurer, was elected Vice President. Roger Madden was elected Treasurer.

* * *



Martin Cooper was honored by President Alimpich, who awarded him a certificate commending his service as VTG President during 1972 and 1973.

* * *

The Treasurer reported that our 1975 financial picture appeared good with the year-end net worth projected to be about \$12.7K, substantially the same as the \$12.8K on hand at the beginning of the year. John's projection for 1976, however, is far less attractive. Increasing costs, and changes in IEEE's financial support of technical activities are expected to combine to reduce our net worth to essentially zero by year end. It was decided that we should fight the loss in IEEE support through our representative on the IEEE Board of Directors. The need for a dues increase in 1977 was discussed and a motion to increase the dues by \$2, effective with the billing sent out in the fall of 1976, was approved.

* * *

Publications were an important subject of discussion both at the Adcom meeting and at a meeting of the VTG Publications Committee, held prior to the Adcom meeting. Increasing the quantity of pages published in the VTG Transactions while living within the dollar limitations of the publications budget presents a real challenge to the publications staff. Various alternatives for improving the situation were proposed and are now being investigated.

* * *

A survey of the VTG membership had previously been approved by the Adcom, and, at this meeting, the secretary was assigned the task of developing the survey form and getting the survey underway. The results of the survey will help the ADCOM better understand what the members want and expect from membership in VTG.

* * *

After discussion of alternative locations, Boulder, Colorado was selected as the location of the 1978 VTG Annual Conference. The Denver-Boulder VTG Chapter will be the hosts.

* * *

Reports were received from both the 1976 and 1977 conference committees. Stu Meyer reported in detail on his committee's efforts to assure an excellent conference in Washington, March 24-26, 1976. A more than adequate number of papers have been submitted, and the committee has gone to extra effort to assure good attendance by scheduling other related meetings just prior to the conference and by having special sessions on various topics (for example: EMS). The planning for the 1977 conference at Orlando is not as far along, of course, but George McClure reported on his committee's progress. Orlando in the early spring -- well at least they shouldn't have to worry about attendance.

* * *

The Adcom spent some time discussing ways and means of achieving increased support and involvement on the part of all of its members. Several suggestions were offered and action is underway on the most promising of these.

CALL FOR CANDIDATES ADCOM NOMINATIONS

Part 2, Section 2 of the Vehicular Technology Group By-laws requires the solicitation of candidates for the VTG ADCOM. This may be done through the Group Newsletter or direct mailings to all members. The Newsletter announcement is a direct mailing to each member and is less expensive. We have, therefore, chosen this route. In addition, each Chapter chairman will be requested to submit candidates. This is being done to assure maximum coverage for this important function.

Five newly elected members of the VTG will take their seats on the ADCOM for a period of 3 years beginning January 1, 1977. However, they will be expected to participate in the fall meeting of the ADCOM following their election in 1976.

Any member of the IEEE is eligible for election to the ADCOM and may submit his name, or have his name submitted, providing the following criteria are met:

1. He must have been a member of the VTG for at least one year prior to his nomination to the ADCOM.
2. He shall be interested and actively engaged in one of the fields of interest covered in the "Scope" of the VTG.
3. He must be able to attend all scheduled meetings of the ADCOM for each of the 3 years in office.

4. He must be willing to actively participate in one of several ADCOM sub-committee activities.
5. He shall submit to the Chairman of the Nominating Committee a 150 to 200 word summary of his professional and IEEE activities. Standard forms for this resume are available from the Nominating Committee Chairman or any VTG officer.

The name, including home and preferred mailing address, business affiliation(s) and telephone number of any candidate to be considered for nomination must be submitted to the Chairman of the Nominating Committee to be received no later than May 14, 1976.

The slate of at least 10 nominee/members will be prepared by the Nominating Committee and presented to the ADCOM for consideration and acceptance at their June 1976 ADCOM meeting.

NOMINATING COMMITTEE CHAIRMAN

Nicholas Alimpich
Michigan Bell Telephone Co. (E145)
23500 Northwestern Hwy.
Southfield, Michigan 48075
Telephone: 313-424-0186

ADCOM ELECTION

The ballots from the recent ADCOM election have been counted and five new members have been elected to a three-year term beginning January 1, 1976:

Nicholas Alimpich - Michigan Bell Telephone Company

Martin Cooper - Motorola, Inc.

Olin S. Giles, Jr. - General Electric Company

Dale M. Grimes - University of Michigan

Roger Madden - FCC

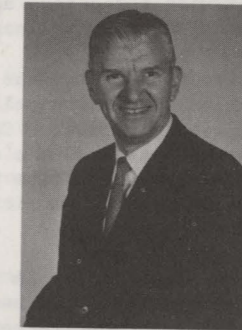
The five members elected will serve with the following 10 members to make up the 15-member ADCOM for 1976.

| | | |
|----------------|---|-----------------------|
| A. Brenner | - | Motorola |
| J. Cassidy | - | General Motors |
| S. Meyer | - | RCA |
| J. Neubauer | - | Urban Sciences |
| N. Shepherd | - | General Electric |
| C. Brooks | - | Consultant |
| S. Lane | - | County of Los Angeles |
| F. Link | - | Consultant |
| S. McConoughey | - | FCC |
| T. McKee | - | General Electric |

Informal biographical profiles follow for the newly elected ADCOM members.

* * *

PROFILES OF RECENTLY ELECTED ADCOM MEMBERS



PROFILE... NICK ALIMPICH

Nick has been involved in Communications all his adult life and in one form or another for the past 40 years. After graduating from Cass Technical High School in 1937, he took a job with the Philco Corporation as an automotive radio technician. Prior to joining Michigan Bell Telephone Company in October, 1939, he worked in the advertising field and the Detrola Radio Corporation.

At Michigan Bell, Nick started his career as a switching systems technician in the Central Office of the Plant Department. He continued in this post until May, 1941, when the U. S. Navy beckoned him from reserve to active service. He rose from 2nd class radioman to Chief Radio Technician in the submarine service during the period May, 1941, to October, 1945. Most of his time was spent overseas in both the Atlantic and Pacific theaters. This included 2 years in Australia. His work was centered around communications, radar and sonar systems.

Upon returning home from service, he came back to Michigan Bell and assisted with the introduction of the Bell System into the Mobile Radio Services. Nick continued with the Plant Department as a Field Engineer until his transfer to the General Engineering Department as an Engineer in April, 1953. As an engineer, he spent a number of years working in all phases of radio communication, including: Microwave, Coastal Harbor, VHF Maritime, Military point-to-point and Mobile Radio Systems design and maintenance. In 1960, he spent one year in New York City with Western Electric as a communications systems design engineer for Project Mercury, the first man-in-space program. He is currently a supervising Project Engineer in the Transmission and Protection Division of the General Engineering Department.

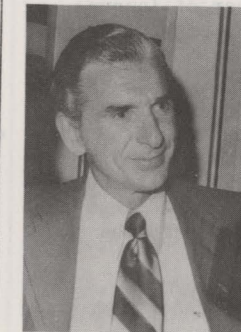
Nick has been active in IRE-IEEE since 1946, having gone through the chairs of the local VTG chapter, the Southeastern Michigan Section IEEE and most recently, the National Vehicular Technology Group. He has just been reelected to his third term to the VTG Adcom.

He has studied at the University of Michigan, University of Detroit and Wayne State University, majoring in Communications and Electrical Engineering.

He has been an active radio amateur (W8PYW) since 1936; holds a radiotelephone license from the FCC; was elected a Fellow of the Radio Club of America and is a Pioneer in the Telephone Pioneers of America. He has also spent 10 years as an Explorer Advisor, Post 435 Boy Scouts of America.

Nick and his wife, Muriel, both born and reared in Detroit, are the parents of three children -- a daughter and two sons.

Nick's hobbies include amateur radio, photography, camping, hiking, automotive restoration, traveling and gardening.



PROFILE... MARTY COOPER

Martin Cooper has been deeply involved in the Land Mobile Industry for twenty-two years and has been active in the Vehicular Technology Group for most of this period. He has been on the Administrative Committee since 1966 and before that held several offices, including Chairman of the Chicago Chapter during which time the Chicago Chapter won the Chapter-of-the-Year Award each year.

The bulk of Marty's career has been at Motorola. Marty is presently a Vice President of the Corporation and Director of Systems Operations for the Communications Group. Before coming to Motorola, he was a submarine officer in the Navy and spent a short period as a Research Engineer at Teletype Corporation.

Although his career has spanned every aspect of our industry - from research to manufacturing, to marketing, to management - engineering has always been his first love. He has been granted a number of patents, the most recent of which recognized the creation, with a number of his Motorola associates, of a cellular portable radio-telephone system.

He was a key contributor in the IMTS (Improved Mobile Telephone System) development in the 1960's and has made numerous contributions in the development of quartz crystal technology as applied to the Land Mobile Industry.

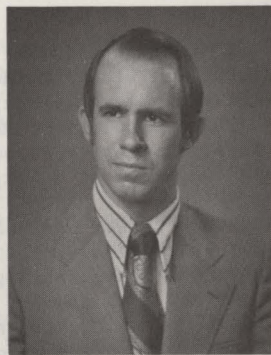
Marty managed Motorola's Portable Products activities for a number of years and introduced several important product lines with the emphasis, always, on technology. The most recent of these was the Pageboy II product line which incorporated such advanced technologies as hybrid integrated circuits, LSI, custom linear circuits, and monolithic crystal filters.

He spent a number of years participating in the Land Mobile Industry effort to encourage the FCC to allocate a new band of frequencies in the 900 MHz region to the frequency congested land mobile services. He testified several times in formal FCC hearings and established numerous technological guidelines which were ultimately incorporated, in 1975, into the Commissions Memorandum Report and Order which allocated 115 MHz to the Land Mobile Services. He has published papers on a variety of topics related to our industry, several of which have been published in the Vehicular Technology Transactions.

Marty has always been interested in people. He believes strongly that people are more productive when they enjoy their work and when they can participate enthusiastically in every aspect of what they are doing. He has carried this philosophy from the engineering laboratory into manufacturing activities with encouraging results. These efforts resulted in a number of innovative techniques for individuals and group participation in the manufacturing environment.

Marty received his BSEE and MSEE from the Illinois Institute of Technology in 1950 and 1956, respectively. He plays tennis and skis during his limited free time, but his real love is riding his horse. He can be seen astride his horse on the Cook County Forest Preserve Trails every Sunday morning of the year, regardless of the weather.

He lives in Glencoe, Illinois with his wife Barbara, son Scott, and daughter Lisa.



PROFILE... OLIN GILES

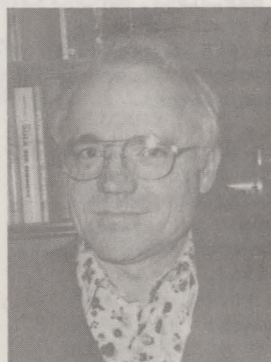
Olin Giles has been engaged in communications engineering work since he graduated from North Carolina State University with his BSEE in 1962. He joined GE's Mobile Radio Department in Lynchburg, Virginia where he has worked on a variety of assignments leading to his current position.

Most of his early experience was involved with land mobile receiver design, but he was also able to gain some experience on the transmitter design side of the house. In 1971, Olin was named the Manager - RF Design for GE's mobile and station product lines. He held this position until 1975 when he was appointed Manager - Mobile and Station Engineering. In this new position, he is responsible for managing all of the work associated with the design and development of the mobile and station product lines.

Over the years, Olin has undertaken a number of company-sponsored technical and management courses. He successfully completed GE's Advanced Engineering A-Course, a post graduate course in engineering fundamentals, and after five years of part-time effort, he received his M.S.-Physics from Lynchburg College in 1969.

Olin has been active in IEEE for many years. He has delivered technical papers before the VTG annual conference, and, most recently, is serving as the VTG Newsletter Editor. This is his first term as an elected ADCOM member.

In his small amount of spare time, Olin enjoys all types of home construction projects - he is currently in the middle of a major remodeling project, photography, reading, and tinkering with his almost classic 1962 TR-4. Together with his wife Judy and two sons, Gary and Randy, he is also a boating, water skiing, and camping enthusiast.



PROFILE... DALE GRIMES

Dale has been associated with The University of Michigan, in one capacity or another, during nearly all of his professional career. He has been a Professor of Electrical Engineering there since 1961. He was ushered into the field of electronics as one of Captain Eddy's 17-year olds (see Spectrum, December 1975) during WW II, then went to Iowa State during the period 1946-1950 and received both the BS and MS degrees. Since during the late forties, Iowa State's electrical engineering curriculum had too many drawing and related courses for his tastes, he switched curricula and majored in physics with minors in math and chemistry. In 1951 he went to Michigan as a Research Associate in electronics and a graduate student in electrical engineering. He received his PhD in EE from there during 1956, and the same year joined the faculty as an Assistant Professor. He has remained there ever since.

From 1956 through 1960, he served as Director of the EE Department's Electromagnetic Materials Laboratory, a position he resigned to help found and be Chief Scientist of Conductron Corporation, manufacturing magnetic materials he had patented as a result of work in the laboratory. He returned to full time University activity during 1964. Since that time, he has been a consultant for many industrial firms, including an eight-year stint with General Motors.

He is now Director of the Bendix Vehicular Electronics Laboratory, a unit of the Electrical and Computer Department of the University. The laboratory was founded by a gift from the Bendix Corporation late in 1974 and now is in operation financed by contractual work with several corporations. Additional contract support from corporate and governmental units is sought.

Dale has been active in professional activities related to automotive electronics since about 1972, as a result of his consultantship with General Motors.

In his private life he has been married, to the same woman, since his early student days at Iowa State. His wife, Janet, is part owner and operator of a small antique-boutique shop in Ann Arbor. There are two children: a daughter who is a graphic artist in Ann Arbor, and a son who is an engineering student at the University of Michigan with ambitions for an MBA. Dale is an instrument rated private pilot, a winemaker, and enjoys skiing, tennis, and sailing.

PROFILE... ROGER MADDEN

Roger Madden is a second-term ADCOM member. He was recently elected as Treasurer of ADCOM, after having been Associate Editor - Communications for the past three years.

Roger's "other job" is that of Chief, Engineering Branch for the FCC's Chicago Regional Office. During the past year he has also served as Acting Regional Manager of the Chicago Regional Office, and was previously Chief of Liaison Section and before that Chief, Spectrum Utilization Section within the engineering branch of that office. He joined the FCC in 1971, having worked previously for Magnavox Government and Industrial Division in Urbana, Illinois as a project engineer and participated in proposals, design and production efforts for AN/ARC-114, AN/ARC-131, and several classified equipments and systems.

Prior employment includes 4 years with General Electric Co's. General Purpose Controls Department as Senior Applications Engineer for 3-phase solid state resistance welding controls and solid state machine controls.

In 1963 and '64, Roger worked at Motorola in the "SP" systems group at 4501 W. Augusta Boulevard in Chicago.

Roger was a two-way radio and industrial sound system technician from 1958 to 1963. During this time he also attended the University of Louisville, Kentucky, and received his BEE in 1963. He served in the USMC from 1954 to 1958 as an aviation radar technician, and also attended University of Louisville (liberal arts) from 1952 to 1954.

Roger, of Willow Hill, Illinois, his wife Lois Sebright of Sumner, Illinois, and their three children live in Cary, Illinois. His current diversions include collecting and repairing Citroen automobiles, golf, and "growing things".

VTG MEMBERS NAMED IEEE FELLOWS

Two VTG members have been recently elected to the IEEE Fellow Grade.

Martin Cooper, Motorola, Inc., was cited for contributions to radiotelephony.

John J. Renner, Advanced Technology Systems, was cited for contributions in the application of systems engineering to telecommunications for government and industry.

Congratulations to Marty and Jack for their election to this high honor.

OUNCES OF PREVENTION

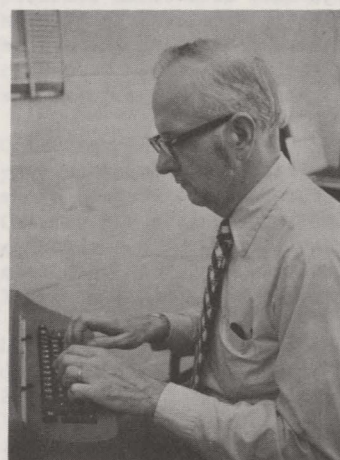
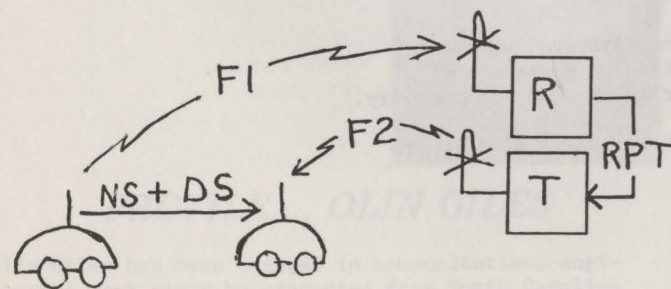
By A. K. "Kenny" GUTHRIE
COMMUNICATIONS EDITOR

"There's only a thin line between fame and notoriety!" Do something constructive with a radio system and you're famous--at least with people who know what goes on. Foul it up, and you're instantly notorious. Assuming you'd like to avoid becoming notorious, here are a few negative suggestions. These are things you shouldn't do--mistakes you should not repeat--as you design and maintain two-way radio systems.

1. DON'T CHOOSE 179.9 Hz as a CTCSS (Tone Squelch) frequency if you're in an area served with 60 Hz power. Sure, 179.9 Hz is listed as assignable in EIA RS-220, but that doesn't make it good. The third harmonic of the 60 Hz power frequency can "trip" your decoder. If ripple in your own station does not do the job, we can recover 180 Hz from the power supply or a telephone line at a undesired distant station. 123.0 Hz (which gets close to the second harmonic of 60 Hz) isn't nearly so bad, but why tempt fate? If you're in an area served by 50 Hz power, you should avoid 151.4 and 100.0 for the same reasons.

2. DON'T CHOOSE low tone squelch (CTCSS) tones when you have a viable alternative. All other things being equal, decoder pickup time varies inversely with tone frequency. It takes twice as long to decode 71.9 Hz as to decode 141.3 Hz. It's better to lose the first syllable than to lose the first word!

3. DON'T PRECLUDE car-to-car communication by your efforts to improve it. When one needs to communicate mobile-to-mobile beyond the limits for direct transmission, a repeater is the logical tool. The desired path is from one mobile (on F1) to the repeater--and from the repeater (on F2) to the other mobile. Mobile-to-mobile communication is possible, at least in theory, when both mobiles are within range of the same repeater.



The problem arises when mobiles are close to each other, but distant from the repeater. Transmitter Noise (NS) and Receiver Desensitization (DS) rear their ugly heads. How close is "too close" and how distant is "too distant" are all variables. They depend upon transmitter power levels, the separation between the two frequencies, and the characteristics of the transmitters and receivers. If there is the slightest loss of receiver performance at F2 when a nearby transmitter is operated on F1 (and there will be such a loss in practice), you are set up for trouble! There will be places at the fringes of the repeater's coverage area where mobiles can communicate with mobiles across the county, but cannot communicate with mobiles which are within "eyeball range!" And, the worst case is when the mobiles are bumper-to-bumper. Explain that to a deputy sheriff (or to a governor)! With lower mobile transmitter power, higher repeater transmitter power or increased frequency separation, you move the trouble areas out farther from the repeater, but you don't get rid of 'em. They will exist--someplace!

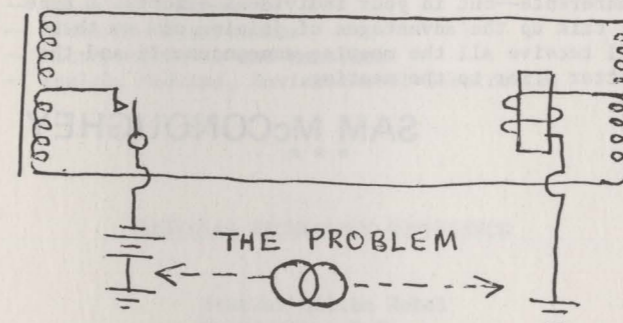
One corrective approach is system overdesign. You make the trouble areas fall far beyond the needed communication range. Murphy's Law controls as usual, however. It is only a matter of time until the user expands his prime operations into the area you planned to serve as a cushion.

Frequency separations and equipment design permitting, you can provide frequency switching for car-to-car communication in the problem areas. The mobile transmitters can shift to F2, or the mobile receivers can shift to F1. Both bring operational problems, since the user may not recognize the cause of his difficulty and know that frequency shifting is necessary. At least, you've improved the status from "impossible" to "difficult" and that is in the right direction!

4. DON'T ASSUME a receiver filtering deficiency just because you hear CTCSS tone in a receiver. Certainly, a low-frequency residual "buzz" in the receiver is an annoyance. Certainly, you'd like to be rid of it. And, although you may be short on reject filtering in the receiver, that's not the only possible cause. In fact, it's not even the most likely cause. Look for encoder distortion first. A distorted tone will drop harmonics across the audio passband at intervals equal to the tone squelch frequency. The "beats" between harmonics give you the sensation of the tone itself.

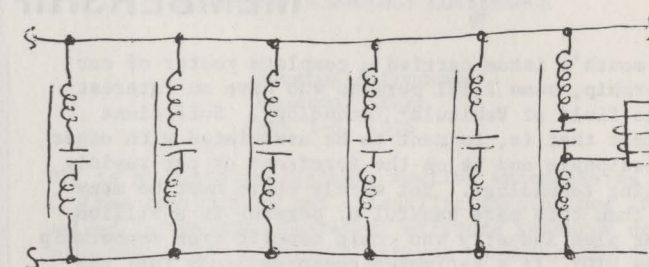
Check first with a harmonic distortion meter driven by a modulation monitor. If you measure more than a few percent, look for the cause. A distortion measurement at the encoder output will point to either encoder or modulator as the distortion source. If it is the modulator, the solution may be as simple as retuning the modulator, or reducing the encoder output to one the modulator can handle without distortion. In any event, work with the source (encoder and modulator) first before you tear into the receiving end.

5. DON'T IGNORE ground potential differences when you use simplex telephone line connections.



If you choose simplex (line-to-ground) control and "ground" is not at the same potential at both ends, you're a candidate for falsing of your control functions. Obviously, low current functions (such as those which operate at 2.5 mA) are the most vulnerable. And, solid state switches (which may be able to respond to noise at 60/120/180 Hz) are more likely to malfunction than are relatively sluggish relays. A high-pass filter ahead of the controlled device (with cutoff above 180 Hz) can settle down some unhappy situations. Otherwise, a line-to-line keying arrangement (composite) provides a way out.

6. DON'T PILE UP line split capacitors when you use line-to-line telephone hookups.



You have many remote control units in parallel across the same telephone line. Each one has the customary 4 uF line split capacitor. When one "keys" from a remote, nothing happens at the base station until all of the line split capacitors have taken their charge. And, when the remote is unkeyed, the station transmitter doesn't drop until the charge drains from all the capacitors. So, you have slow turn-on, and slow turn-off. Sometimes it seems that you need "thirty days written notice" of your intent to say something! And, when telephone lines are short and your "battery" is not current regulated, you can have your own fireworks at the control contacts. It takes a lot of current to charge up this "capacitor bank."

Rather than live with the situation, you can replace the line split capacitors with something much smaller than usual, say with values around 0.1 uF. This speeds things up, and gives keying contacts somewhat longer life expectancy. The effect on system audio response is usually beneficial, since a bunch of paralleled remote control units tend to roll-off the high audio frequencies.

CONTRIBUTIONS, ANYONE? This collection of "goofs" is far from exhaustive. Having made a few mistakes myself, and having followed a number of other practitioners of the art, I have plenty of material to start another article along this same line. Not having a corner on the market, though, I'll welcome your own "Ounce of Prevention" should you care to send it along.

--Kenny Guthrie

MESSAGE FROM THE MEMBERSHIP CHAIRMAN

Last month's issue carried a complete roster of our membership, some 2,372 persons who have an interest in the field of Vehicular Technology. Sufficient interest that is, to want to be associated with other professionals and be on the forefront of our rapidly changing technology. But surely there must be many more than this mere handful of persons in a billion dollar plus industry who could benefit from membership in the VTG? It's estimated conservatively that the potential could easily be three to four times the number we now count on our rolls.

How then can we increase our membership--tap the resource of new talent and inject new blood into an organization whose membership has been relatively constant over the past five years, even though the industry has grown at a 5-10% rate annually?

Individually you can help. Take a poll of your associates. How many members of IEEE? How many are members of VTG? (You'd be surprised how many are not.) Encourage them to join. If each of you were to obtain only one new member--we could double our membership. You personally can outline the benefits of IEEE and Group membership far more effectively than all the literature available for this purpose. Loan them a copy of the Transactions, Proceedings,

Group publications--and tell them of the excellent insurance plans, technical conferences and conference publications, the legislative support programs. How can anyone who calls himself a professional in the field afford not to join?

The Section Chairman can also do a great deal to promote membership. Each should have at least one person who will promote new members at each meeting. A ready supply of Form F-33's should be on hand at each meeting. Each member should carry a few, as I do. This form describes VTG activities, publications, meetings, field of interest and contains a postage paid membership application blank, to make joining painless and prompt. If you don't have a supply in your Section--order some now along with Form F-69 which details the benefits of membership in greater detail.

As a parting remark, I'd also like to put in a plug for the 26th Annual Vehicular Technology Conference to be held in Washington, D.C. next March 24-26. We intend to have an intensive membership drive during the conference--but in your individual efforts, I hope you'll talk up the advantages of joining now so that they'll receive all the meeting announcements and the Newsletter prior to the meeting.

SAM McCONOUGHHEY

REQUEST FOR INFORMATION

Please send me information on joining the VEHICULAR TECHNOLOGY GROUP of the IEEE.

I presently am _____ am not _____ a member of the IEEE.

Last Name First Name

Street Address

City State/Country Zip Code

Telephone

Please send to: Sam McConoughey
Federal Communications Commission
1919 "M" Street, N.W.
2025 W.A.
Washington, D.C. 20554

CONFERENCES



INTERNATIONAL SOLID STATE CIRCUITS CONFERENCE

Marriott Hotel
Philadelphia, Pa.
February 18-20, 1976

- Integrated Electronics
- Circuit Techniques, New Devices
- Optoelectronics
- Microwave Electronics
- Microprocessors and Memories
- Health, Medical, Environmental Electronics

* * *

VEHICULAR TECHNOLOGY CONFERENCE

Statler Hilton Hotel
Washington, D.C.
March 24-26, 1976

- Mobile Communications Systems, Hardware, and Technology
- Automotive Electronics
- Transportation Systems

* * *

ELECTRONIC COMPONENTS CONFERENCE

Jack Tar Hotel
San Francisco, Ca.
April 26-28, 1976

Sponsored by EIA and the Parts Hybrids and Packaging Group of IEEE.

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OFFSHORE TECHNOLOGY CONFERENCE

Houston Astrodome
Houston, Texas
May 3-6, 1976

OTC is an interdisciplinary meeting encompassing the diverse engineering and scientific disciplines involved in the many facets of offshore resource development. The technical program contains 285 papers in 42 technical sessions. The industrial exhibits are extensive.

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CARNAHAN CONFERENCE ON CRIME COUNTER-MEASURES

University of Kentucky
Lexington, Ky.
May 5-7, 1976

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ELECTRO (IEEE INTERNATIONAL CONVENTION)

Boston Sheraton Hotel.
Boston, Mass.
May 11-14, 1975

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INT'L CONFERENCE ON COMMUNICATIONS

Marriott Motor Hotel
Philadelphia, Pa.
June 14-16, 1976

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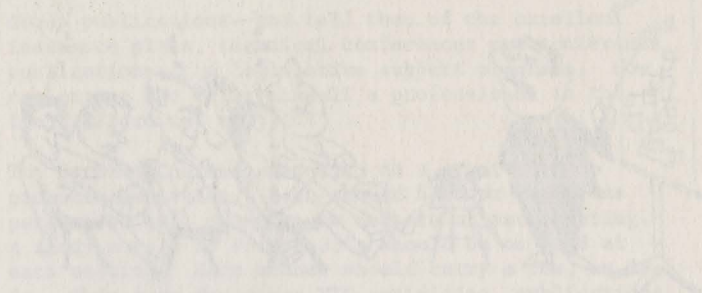
CONFERENCE ON PRECISION ELECTROMAGNETIC MEASUREMENTS

National Bureau Standards
Boulder, Co.
June 28 - July 1, 1976

Topics include measurements of fields and signal characteristics such as power, current, voltage, field strength, and frequency; transfer characteristics of devices and networks, such as impedance, attenuation and the electromagnetic properties of materials.

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SAW McCONUGHEY

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