

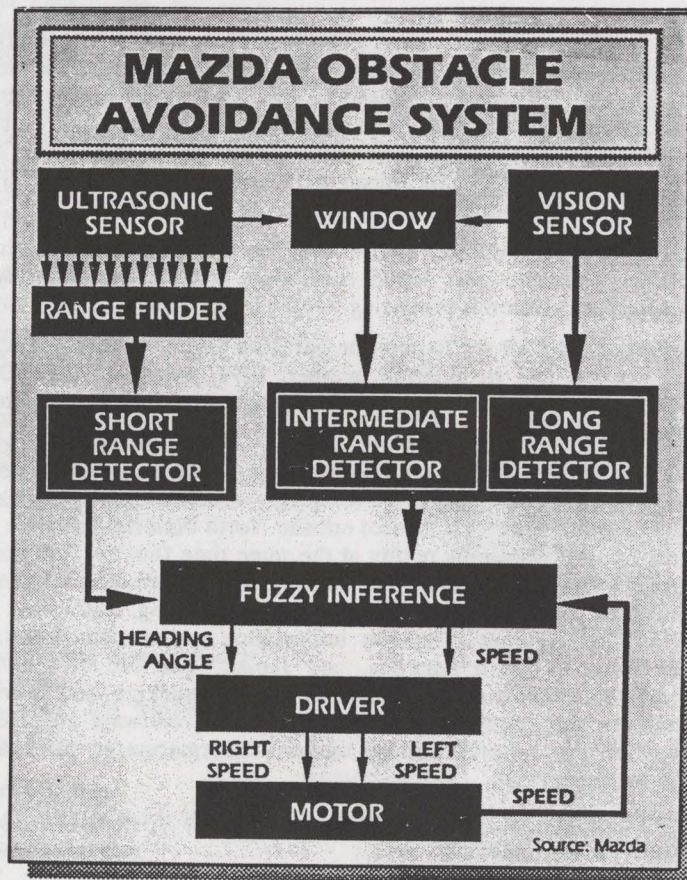


IEEE

VEHICULAR TECHNOLOGY SOCIETY

NEWSLETTER

Vol. 36, No. 4, November 1989 ISSN 0161-7887 Editor: A. Kent Johnson

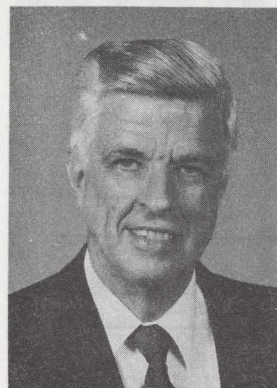


Mazda Ultrasonic/Vision Sensing Fuzzy-Logic Obstacle Avoidance System

(See "Vehicular Electronics," page 14)

President's Message

George McClure
President
IEEE Vehicular Technology Society



This issue of the Newsletter comes on the heels of the first-ever Vehicle Navigation and Information Systems (VNIS) conference, co-sponsored by the IEEE Vehicular Technology Society and the Canadian Department of Transportation and Ministry of Transport. The conference had 380 attendees, showing keen interest in the use of vehicular technologies for traffic management, vehicle tracking, and communications. Rye Case and his committee, together with Stuart Meyer and Bob French of the VTS Board, have our thanks for a superlative job in producing this conference.

We plan for this conference to be held in the future alternating with Convergence. Thus the next VNIS conference will be held in 1991. The Southeast Michigan section is proposing to host it in Detroit.

The response to the Call for Papers for our 40th IEEE Vehicular Technology Conference, to be held in Orlando in May, 1990, was gratifying. Over 140 papers have been accepted for the technical program. Mark your calendar and plan to attend VTC'90, May 7-9.

The minutes of the Board of Governors meeting, found in this issue, reflect the growth in your Society's activities. Preliminary contacts have been made that could lead to some future conferences outside North America. Mobile satellite communications is becoming a reality at the same time that the first generation cellular mobile telephone systems are reaching traffic saturation in some major markets and the standards for digital cellular are being established for the second generation systems. Highway information system demonstrations are planned in Europe, North America, and Japan. The use of "just-in-time" inventory delivery systems makes vehicle scheduling, tracking, and coordination more important than ever before, while congested roadways are used more effectively when the motorist receives advisory information on the best routes available to his destination.

Standards will be needed for the in-vehicle portions of these autoguide systems and that work is only beginning.

These are exciting times for VTS!

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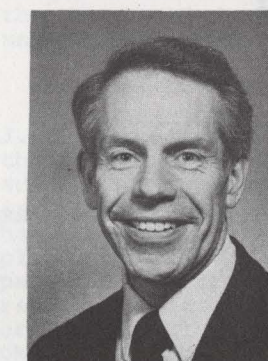
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Editor's Notes



A. Kent Johnson
Newsletter Editor

This issue of the Newsletter reports the events of a recently held meeting of the VTS Board of Governors. The meeting was held on September 14, 1989 at the King Edward Hotel in Toronto, Canada. It was held in conjunction with the first Vehicle Navigation and Information Systems (VNIS) conference sponsored by VTS and the Canadian Department of Transportation and Ministry of Transport. The conference was a big success. Details of the Board of Governors meeting are included in this Newsletter.

Plans are moving forward for the next VTS conference in Orlando in May of 1990. The response to the Call for Papers has been excellent and it looks like another fine conference coming up next year.

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Month of Issue	Final Copy to be Rec'd By VTS Editor	Target Mailing Date
February	12-29-89	1-31-90
May	3-10-90	4-14-90
August	6-9-90	7-14-90
November	9-15-90	10-13-90

*Inputs for newsletter staff editors should be received by newsletter editor at least one week before these dates.

Society Officers and Board of Governors

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Leo M. Himmel(89)	Chairman, Education Committee
A. Kent Johnson(89)	Newsletter Editor
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Fred M. Link(89)	National Site Selection
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Evan B. Richards(90)	National Conference Chairman
Jesse E. Russell(91)	Standards Chairman
Raymond C. Trott(90)	Membership Chairman

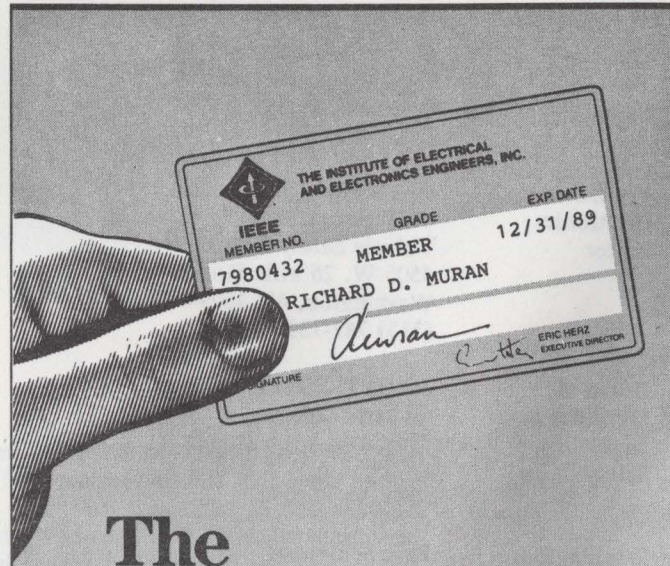
A Vehicular Technology Society Chapter is being formed in Ottawa. Preliminary details of the inaugural meeting are listed below. Full details will appear in the next issue of *Window*.

A HISTORY OF LAND MOBILE RADIO

Stuart Meyer, consultant, Washington, DC
 President's Room, Unicenter, Carleton University
 8 pm Tuesday Dec 5th 1989, bar opens 7.30 pm.

Stu Meyer is a former President of IEEE-VTS. He has spent all his career in land mobile radio; he will give a detailed, anecdotal illustrated talk on the development of land mobile radio in North America.

For further details contact
 Hugh Reekie 990-4099 (b) 728-5343 (h)



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Board of Directors Report

James M. Sears

VTS Secretary

MINUTES OF THE IEEE VTS BOARD OF GOVERNORS MEETING

The IEEE VTS Board of Governors met on September 14, 1989 at the King Edward Hotel in Toronto, Ontario. The meeting was called to order at 9:00 AM.

ROLL CALL

The following were in attendance:

Linda Sue Boehmer	88-89 LTD Chmn.
Rye Case	VNIS 89 Conf Chmn
# J. R. Cruz	Asoc Newsltr Ed.
# Bob Fenton	Sr Past President
Robert French	Nav/Info Sys Chmn
# Arthur Goldsmith	Const/Bylaws Chmn
Leo Himmel Sr.	Coord Land Trans.
	Activities
Mark Krage	S.E. Michigan
	Chapter Chmn.
# Sam Leslie	Treasurer
# Fred Link	VTS Site Select.
# Roger Madden	Vice President
# George McClure	President
# Stu Meyer	Past President/ Nominations/Award
	Transactions
Giorgio Rizzoni	Assoc. Editor
	Secretary
Jim Sears	Membership Chmn
# Ray Trott	Chptr. Activities
	Commission of the
Andre Vit	European
	Community

Nine elected board members were present at this meeting. A quorum was thus present.

The President modified the agenda, and after discussion, it was approved with corrections. Minutes of the 4/29/89 previous meeting were approved with the following correction. The special Transaction publication on Highway Electronics is scheduled for November 1990 instead of 1989.

CONVENTION PRE-REPORT

Rye Case gave the following report on the first VNIS conference held in Toronto just prior to the Directors' meeting. The conference was planned for 200 to 250 attendees; however, 380 persons registered. This was in spite of IEEE headquarters failure to mail advanced conference bulletins. The board thanked Rye and his committee for a well organized and well executed conference.

TREASURER'S REPORT

Sam Leslie presented the treasurer's report. Roger Madden moved and J.R. Cruz seconded its adoption as amended. Approval was

unanimous. In brief, 1989 income for VTS through June was \$186.3 thousand against a budget of \$136.7 thousand. Expenditures for the same period was \$43 thousand. Society membership stands at 2,804 members.

PUBLICATIONS

J. R Cruz, publications chairman, reported that reviews of communications Transactions are now up-to-date. Twelve papers submitted in 1988 plus 41 papers submitted in 1989 have been processed. A system is now in place to respond to authors and process papers in a timely manner. Paper quality remains quite good with a large number originating from Japan. The University of Oklahoma School of Engineering is providing a half time secretary to assist with processing the papers.

Giorgio Rizzoni, Transactions associate editor, reported that he has obtained the original Transactions files which included a backlog of 8 papers. Twelve new papers have been submitted with all but 2 already approved. The University of Michigan is funding a quarter time secretary to assist with the paper review process. Giorgio requested that the field of automotive electronics be more precisely defined to assist in categorizing papers. Linda Sue Boehmer was assigned to review the definition with the Land Transportation Society and report back.

Four Transactions issues are planned this year including two special issues. 596 pages are budgeted for the four issues. From previous meeting minutes these upcoming special issues are being planned.

Highway Electronics (November 1990)
 Digital Cellular (Late 89-Early 90)
 Navigation & Information Systems (1990)
 Non-Cellular Communications (1990)

Art Goldsmith pointed out that the page count budget for 1991 publications was needed by the next Directors's meeting. The Publications committee is to prepare the budget request.

CONFERENCES AND MEETINGS

Evan Richards mailed in a report of conference planning activities.

40th VTC Orlando, FL, May 7-9, 1990

George McClure, conference chairman, reported on the conference to be held at the Sheraton Plaza. About 180 paper summaries have been received for acceptance. Reviews are in process. The conference will run three full days including 30 technical sessions. A maximum of 150 papers will be selected for presentation.

41st VTC St. Louis, May 19-22, 1991, Sheraton Westport

Evan Richards submitted a report of conference plans. Jay Underdown is serving as Conference chairman. The next committee meeting is planned for September. Land

Transportation is assisting with conference preparation.

1991 VNIS Conference

The Toronto section has declined to sponsor VNIS '91. However, they will consider future sponsorship. Mark Krage, Southeast Michigan chapter has expressed interest in the 1991 sponsorship. Bill Spritzer is considering chairmanship. Tentative thinking is October date.

42nd VTC Denver, May, 1992

John Tary, Denver section, is conference coordinator. The second week in May has been targeted for the conference. A down town facility is planned for the conference.

Joint RR/ASME Conference, Chicago, April 17-20, 1990

Linda Sue Boehmer reported that ASCE is cosponsoring the conference. John Punwani, AAR, is conference chairman. Plans are on schedule.

Joint RR/IEEE Conference, St. Louis, May, 1991

An organizational meeting is planned in late September. Robert Love is ASME contact that Jay Underdown is coordinating.

Joint RR/ASME Conference, St. Louis, September, 1992

ASME has declined to jointly hold the 1992 Railroad conference in Denver. Instead the RR conference will be held late September in St. Louis.

43rd VTC, 1993

Dave Goodman reported that there was interest in having a VTS conference in Europe in 1993. Previously, many papers have been submitted from Europe. Only 65% of the papers are from the USA. Roger Madden suggested the possibility of cosponsoring a meeting with a European conference. Art Goldsmith was appointed to call Bob Fenton, not present, regarding a possible European conference.

VNIS 1992 & FUTURE

Bob French proposed that both Europe and Japan be considered for possible conference sites. Dr. Vits, head of the DRIVE office of the Commission of European Community, expressed support of a future conference in Europe. A conference chairman in Europe is needed to continue planning. Bob will continue working with Dr. Vits to select a chairman and form a committee for the 1992 potential European location.

VNIS 1993 plans for a North American location have not yet started. Ottawa is being considered perhaps for a VTS and VNIS back-to-back meeting at the same location. Plans should be more specific at the next directors' meeting.

The VTS Japan chapter has been contacted regarding a possible VNIS '94 being held in

Japan. VNIS plans to alternate between North American locations and Europe or Japan.

44th VTC, 1994

Bob Fenton reported that the VTS Swedish chapter has expressed interest in organizing the 1994 conference in Sweden. Plans continue.

Convergence Conferences

Convergence 1990, October, 12-17 - Bob Fenton reported that four meetings of the Convergence 90 Executive Committee have been held. The theme will be "Vehicle Electronics in the Nineties - Solving the Challenges: Economy and Emissions, Security and Mobility, and Customer Expectations. The conference is scheduled to be held at the Dearborn, Hyatt Regency. Robert Mazzola is Conference Chairman. The '90 Convergence Banquet tentative speaker is President Bush. Banquet tickets are \$60 each. Bob Fenton moved that two tables with 10 to 12 seats each be reserved for VTS directors and guests. Fred Link seconded and motion was unanimously approved. Roger Madden moved and Leo Himmell seconded a motion that VTS sponsor the luncheon. This also carried.

Convergence 1992, October 17-22, 1992 (VTS sponsored) is scheduled at the same location with Robert Mazzola serving as Conference Chairman.

COMMITTEE REPORTS

Nominations Committee

Since no nominations were made for new officers, the same officers were elected by acclamation to serve in 1990.

George McClure	President
Roger Madden	Vice President
Sam Leslie	Treasurer

Jim Sears was reappointed as secretary for next year by the President.

Land Transportation

Linda Sue Boehmer reported that the 1990 conference is proceeding on schedule with ASME leading. The call for papers is out. 1992 is an ASME lead year for the Joint Rail Conference. The ASME board has rejected Denver as a meeting site. Since VTC is already locked in to the Denver site, Land Transportation Division will attempt to coordinate meetings in conjunction with VTC in IEEE-lead years instead of every year. ASME has expressed no interest offshore meetings because their membership is not free to travel overseas.

Constitution and Bylaws

Art Goldsmith reported that ballots for the revised constitution closed out August 25th and that the vote was overwhelmingly in favor of the revision. Roger Madden has done a first draft of the by-laws which will be pursued next.

Membership

Ray Trott distributed a July activities report which listed 2,734 active VTS members. This included 217 student members. Total membership is up approximately 10% over the past year. An ad has been placed in "Potentials" magazine promoting membership in VTS. Ray is also working on ways to promote Associate memberships.

Since the Director's meeting, the secretary has received word that Mr. Luther G. Schimpf, retired Bell engineer and Fellow of IEEE deceased September 13, 1989.

Publicity

No report was available for the meeting. A chairman is needed for this committee.

CCIP Representative

Eric Schimmel has been appointed as CCIP representative. No report was given.

USAB Engineering R&D

Thomas Stanley, was recently appointed as USAB representative. A report was not available.

Transportation Electronics Fellowship & Noble Fellowship

Bob Fenton reported that the internationalizing of the two Fellowships had been carefully studied by the Noble and Transportation Fellowship committees. Their recommendation is to retain the present organizational arrangements and criteria, emphasizing that the Fellowships are awarded independently of race, creed, sex or national origin. To internationalize the Fellowships would require substantial increase in administrative resources. Also the evaluation of applications from foreign universities would be extremely difficult to execute objectively.

Arthur Goldsmith moved that the committee recommendation be accepted. It was seconded by Sam Leslie and unanimously approved. The committee will continue to mail out applications for the Fellowships to the 235 Electrical Engineering departments in the USA and Canada.

Stuart Meyer is acting as committee chairman for the Noble Fellowship committee.

Chapter Activities

Stuart Meyer reported that he is working with Hugh Reeke to start a VTS chapter in Ottawa.

Standards

Leo Himmell reported that the New York City Transit Authority has contacted him regarding the status of IEEE standard 16-1955 on "Electrical Control Apparatus for Land Transportation Vehicles". This standard was last issued in 1978. It was suggested that Leo send out a call for committee to update the standard. Anyone who wants to be on the committee should contact Leo.

Stuart Meyer reported that EIA standards are being upgraded to world class standards. The thrust is changing to methods of measurement and less on actual specification limits. APCO is working with EIA to upgrade the standards. VTS also has the opportunity to assist. Stu will contact Jesse Russell, standards chairman, regarding VTS assistance.

Fellows Report

A written report from Al Isberg states that three highly qualified candidates for Fellow Membership have been submitted the Fellow committee for approval. An announcement will be made later this fall.

Al, having served as chairman of the Fellow committee for over three years, is being replaced by Jerome G. Rivard, formerly Chief Engineer- Electrical and Electronics, Ford Motor Company. Al will continue as Chairman of the VTS Fellow Search Committee.

Education Activities

David Goodman could not attend the meeting but informed the secretary by phone that work is continuing in the IEEE Engineering Skills Assessment Committee (ESAP) to define "What do I have to know to be a mobile communications engineer?" This is just one phase of the Engineering Skills Assessment Program within each society. Dave suggested that workshops be combined with future conferences to assist with the assessment program.

Propagation Committee

A chairman is needed to replace Neal Shepherd. No nominations have been received to date.

OLD BUSINESS

Jack Neubauer Award - Roger Madden proposed that a \$500.00 annual paper award be given for the "best systems engineering paper to be called the Jack Neubauer Memorial Award. Fred Link Seconded and the proposal was unanimously approved. This award is to be given only if a meritorious paper is presented for the year.

NEW BUSINESS

The request was made for the Constitution & Bylaws committee to consider adding a list of available paper awards to the By-laws. Roger Madden to follow up the request.

Fred Link moved that a suitable award be presented to Bill Weise who is retiring from Motorola in December. He has been very instrumental in the formation of VTS and served as an early president. Arthur Goldsmith seconded and the motion was unanimous by acclamation. Fred was requested to draft an input for the president to present at a future conference.

Status of the Institute - Arthur Goldsmith, member of TAB, gave a report on changes taking place with IEEE headquarters. In brief, the volunteer restructuring proposal has been submitted by the consultants. A

reorganization of TAB is anticipated. TAB Operations Commission is being replaced by TAB Administrative Council. Three associates are being named to interface with individual societies to simplify communications with TAB. Several technical activities and publications have already moved from New York city to the new facilities in Piscataway, NJ. Minimum disruption of publications is anticipated due to the move.

NEXT MEETING

The next board meeting is scheduled for 9:00 AM Saturday, February 10, 1990, at the

Courtyard by Marriott Executive Park, 6023 Park Rd, Charlotte, NC.

ADJOURNMENT

The meeting was adjourned at 4PM.

Respectfully submitted,

Jim Sears, Secretary

Chapter News



Gaspar Messina
Chapter News Editor

Meetings

Washington, D.C. (Joint VTS/Land Transportation Committee)

Subject: Review of Urban Rail Systems
By: Mr. Robert L. Banks
R.L. Banks, Inc.
Washington, D.C.
Held: May 9, 1989
Attendance: 33 (12 guests)

Subject: ATCS Communications System Architecture and Protocols
By: Mr. Robert C. Ayers
ARING Research
2551 Riva Road, Annapolis, MD 21401
Held: June 13, 1989
Attendance: 45 (4 guests)

Washington Vehicular Technology Society

Subject: Controlling The Electromagnetic Spectrum
By: Mr. Ralph Haller, Chief, Private Radio Bureau
Federal Communications Commission
Washington, D.C.
Held: April 19, 1989
Attendance: 34 (11 guests)

Philadelphia (Joint VTS/Land Transportation Division)

Subject: Computer Aided Dispatching on Conrail
By: Mr. Joseph Dolan, P.E., Senior Circuits Engineer
Conrail
15 N 32nd St., Philadelphia, Pennsylvania 19104
Held: June 15, 1989
Attendance: 31 (17 guests)

San Francisco Bay VTS

Subject: FCC Update
By: Mr. Stuart Meyer, FCC Radio Consultant and former National Vehicular Technology Society President
Vienna, Virginia

Subject: The Lee 800 MHz Propagation Model
By: Dr. W.C.Y. Lee
Vice President PacTel Cellular Inc.

Subject: Theory and Design Considerations for a Mobile Simulcast System
By: Mr. Dennis Cameron
Quintron Corporation

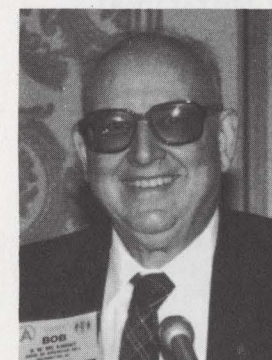
Subject: Future High Capacity Public Safety Radio Technology
By: Mr. Chandos Rypinski, Chief Technical Officer
LACE, INC.
Held: June 27, 1989
Attendance: 67 (43 guests)

Toronto Vehicular Technology Society

Subject: Cellular Communications and CanTel
By: Mr. Roger Keay, V.P. Engineering
CanTel
40 Eglinton Avenue, E. Toronto, Ontario, Canada
Held: April 12, 1989
Attendance: 15 (9 guests)

Gaspar Messina, Physicist/E.E.
Editor and Chapter Activities Chairman
9800 Marquette Drive
Bethesda, Maryland 20817

Transportation Systems



Bob McKnight
Transportation Systems
Editor

Land Transportation Division chapter begins 9th year of monthly programs

The Washington Chapter of the Land Transportation Division of the Vehicular Technology Society begins its ninth year of monthly technical luncheon meetings in the Washington, DC area.

Typical of the types of programs are the first two of the 1989-1990 year:

Sept. 12- Robert A. Carter, Director Electronic & Communications Engineering, Consolidated Rail Corp. described hot box simulation techniques applied to the rail industry. ConRail has a test car equipped with electric heaters and controls that moves by hot box detectors and because of the controlled heaters on the test car, it can be determined if the wayside hot box detectors are operating properly.

Oct. 10- George H. Way, Jr., Vice President Research & Test, Association of American Railroads will discuss railroad research- present and future.
Nov. 14- George Payne, Assistant Director Passenger Service, State Railroad Administration, Maryland, will discuss commuter rail service in the state of Maryland.

Other topics brought before this group of electrical and mechanical engineers have included:

- Legislative outlook at the national level concerning rail and rapid transit.
- AC traction for railroads and rapid transit operations.
- Advanced Train Control System project of US and Canadian railroads covering such aspects as radio communications, digital transmission between moving trains and the central dispatch office, a general overview of ATCS, and its train management functions.
- Channel tunnel now under construction between France and Great Britain.
- Commuter rail service in several metropolitan areas.
- Automatic train control and train operation on heavy rail rapid transit lines.
- The future of light rail.
- Amtrak's new passenger equipment.
- Technical aspects of transportation by suppliers, governmental agencies and consulting firms have been numerous over the past eight years.

Six chairmen for 9 years. This Washington Chapter of the LTD of VTS was founded in 1981 by Leo M. Himmel, Sr., its first chairman. He was and is Executive Director, Communication & Signal Division, Association of American Railroads. Mr. Himmel is presently a Director of the Vehicular Technology Society.

The following chairmen have ably served this Washington Chapter LTD, VTS, IEEE:

- John L. McNabb, Assistant Chief Engineer Communications & Signals, Amtrak.
- Robert W. McKnight, Manager Communication & Signal Engineering, Association of American Railroads.
- Kenneth D. Watkins, Director Motive Power Engineering, Amtrak.
- Theodore S. Gordon, Technical Director, American Public Transportation Association.
- Gerald A. Hott, Senior Signal Engineer, Gibbs & Hill, Inc. Mr. Hott is the current chairman, now serving in his second term.

It should be noted that this Washington Chapter LTD effort also includes mechanical engineers. Co-sponsoring the monthly meetings (September through June, 10 per year) is the Railroad Division of the American Society of Mechanical Engineer.

Philadelphia has an LTD chapter. Beginning its second term, first Fall, operation is a Philadelphia, Pennsylvania chapter of the Land Transportation Division of VTS. Its founder-chairman is Harvey M. Glickenstein, District Manger Transportation Systems Engineering, Thomas K. Dyer, Inc.

Train management system features radio data transmission and computer controls

Harnessing digital communications and computers is not new, but there are now several versions of train management systems that use these concepts, and are available. Testing is quite extensive on several railroads. Systems available in several versions and with various backgrounds and experiences in testing are:

- Advanced Train Control System sponsored by the Railway Association of Canada and the Association of American Railroads. Several suppliers and manufacturers have equipments for ATCS.
- Rockwell-International's Advanced Railroad Electronics System or ARES.
- Railstar Control Technology's system using geostationary satellites in the communications links.
- General Railway Signal Co.'s Spacerrail, a vital radio-based signal and control system.

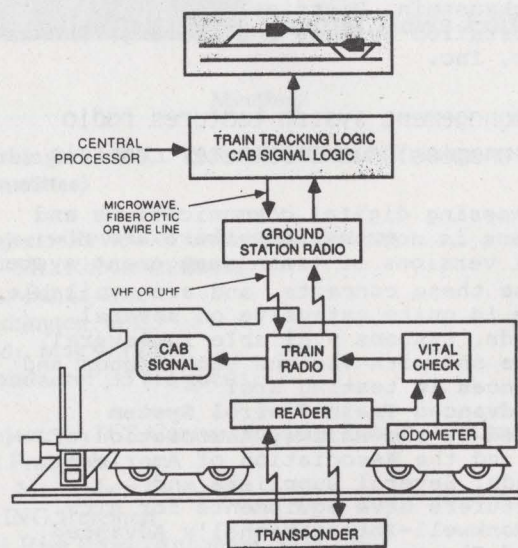
Interest in Spacerrail has been shown by railroads with no signaling in service. Europe, Africa, Asia and Australia are areas where railways have indicated that Spacerrail might be the system they need for train management, especially as these areas are having economic growth and increases in railway business.

Under Spacerrail operation trains report their position to a central dispatch office computer by radio upon the detection of

wayside beacons. The central computer keeps and displays a data base of system status and determines appropriate information to be sent to the train. This information is sent via a digital radio system to the train where it can be displayed in the cab of the locomotive.

The wayside beacons, mentioned above to provide location information are located along the wayside, often known as transponders. They are passive devices mounted to railroad ties and covered with ballast. When energized by a readers on a passing locomotive, the transponders return coded signals that are picked up by the locomotive. These digitally coded signals include such information as Zone identification, length of zone (distance to the next transponder) and identification code for the following zone.

A computer (microprocessor) on board the locomotive processes the transponder information and transmits it via the digital radio to the central dispatch office. There a computer processes the information. In return the dispatch center computer will send the proper information to the train. In the locomotive cab this information can be displayed as a conventional cab signal, or it can be text on a video display unit. As to which form the display takes in the cab is a user decision.



As the section of railroad under Spacerail control is divided into zones, the Spacerail system provides the storing of two signal (or information) aspects on the locomotive- one for the current zone and one for the next zone. Thus each time a locomotive reports passing a transponder, when it sends in this location information to the central dispatch, a return from dispatch will provide the next zone movement information. In this manner a train need not be stopped to receive information about movement- unless, of course, the train is to be stopped.

An odometer on the locomotive provides mileage information that is compared with

the location provided by transponders. The odometer and transponder systems are continuously checked against each other to verify that both systems are operational. In the case that a transponder fails to be read- damaged or stolen, for example, the odometer system will indicate that a new Zone has been entered. (The identity of the new zone is known from the information obtained from the previously read transponder). In this way, normal operation will continue.

When a new zone is entered, whether determined by the transponder or odometer system, the previously stored aspect for that zone is immediately displayed. If for any reason conditions necessitate a change in the currently displayed aspect, the central dispatch can transmit the new aspect at any time and the new aspect will be immediately displayed in the cab of the locomotive.

Data transmission- voice or separate.

The data radio system used can be a separate system or can use existing (voice) train radio systems. The data transmission takes approximately 3/4 second. After the transmission, the locomotive system waits a predetermined time period for an acknowledgement from the central dispatch office. If no acknowledgement is received, the locomotive will re-transmit its message a predetermined number of times.

Based on the data radioed by trains to the central dispatch office, the central computer maintains location data for all trains in the system. Display of such information can be on a display panel or a video display unit, again a decision by the user of the system.

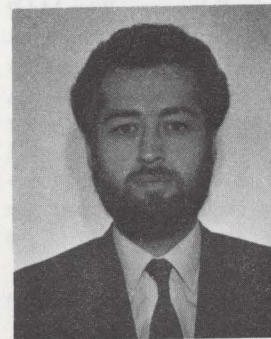
The central computer can send text information to the locomotive cab or it can send signal aspects, depending on the decision of the user. The central computer sends updated information to each affected train when a new location report is received or when a change in movement authority or status is required. Also, the dispatcher has input to the system via a keyboard or touch-screen VDU.

Some of the other features of this train management system include:

- Overspeed control of trains.
- Locomotive performance and operating status (sometimes known as health).
- Train crew data input when they board the locomotive, for example.
- Fuel use optimization.
- Power switch control from central dispatch or from the locomotive.
- Automatic display of civil restrictions.
- Immediate display in the locomotive cab of actuation of slide fences, hot bearing detector alarms, and reports from other defect detectors requiring train crew action.

It appears that there are now several train management systems in various testing stages- Spacerail has been tested on an operating railroad- and what is now needed is each railroad's detailed economic analysis including operational characteristics of the territory where it might apply a train management system.

Communications



J. R. Cruz
Communications Editor

ABSTRACTS

"Influence of Coding and Hardware Imperfections on the Bit Error Structure of Multilevel QAM Systems" Horst J. Bessai, and Werner Lorek, IEEE Trans. on Communications, Vol. 37, No. 6, June 1989.

When putting together 140 Mbits/s 16-ary quadrature amplitude modulation (16 QAM) modems, radio-relay sets, and the appertaining total multiplex/demultiplex equipment, different and even higher bit error ratios (BER's) have been measured at the primary low-level 64 kbits/s outputs as compared to that one at 140 Mbits/s.

As a first step towards an explanation, we show that this "error multiplex effect" is mainly caused by the coding of signal points and, in addition, by hardware imperfections such as carrier and clock phase jitter, nonideal regenerator threshold voltages, etc. We derive the mathematical tools necessary for calculation of the bit error structure at the modem output under optimum and nonoptimum receiver conditions. It is shown how the errors are distributed among the demultiplexer channels. QAM space diagrams of distorted signals are used for calculation of the BER's in the subsystems. Some experimental results emphasize the fact that the multiplex equipment must not be excluded from design considerations for QAM modems. 16 and 64 QAM systems are compared with respect to their susceptibility to the error multiplex effect and a scrambling technique is proposed as a possible means to reduce the BER differences.

"The Cellular Environment of Lightweight Handheld Portables," Raymond Steele, IEEE Communications Magazine, July 1989.

The lightweight, handheld portable can only be realized by either an unforeseen development in the power capacity of small size batteries or the use of very small cells (given that it is unacceptable to be continuously charging the transceiver batteries). Not only does the smallness of cells open up the prospect of batteries that do not need to be recharged for weeks or solar cells that are charged continuously as with calculators, but it is the only means of realizing the high capacity mobile cellular systems of the future. A further spin-off is that the greatly reduced radiation levels are biologically safer. The discourse has focused on microcellular clusters oversailed by macrocellular clusters. Picocells are embedded as required to support mobile communications in special environments and in localities of

intense teletraffic demand. The large cells will exist only in sparsely populated areas, and the mobile transceivers will be of the current "heavyweight" variety. There will be many different types of lightweight, handheld portables, from the "wrist watch" to the "checkbook" size. They will be capable of being connected to larger handheld units required by specialist users. The checkbook size communicator could have flat screen sides that can be opened up to form a larger screen for video transmissions. All the keys will be "soft," and between the screens will be specialized facilities (e.g., for providing high quality audio). The ISDN transmissions can be of different integrity (as measured in BER) and arranged in a TDMA format as described in the section "High Bit Rate Transmissions," or the ISDN services could be transmitted on different bands. If the mobile user only required speech, his portable would be very lightweight and inexpensive. For the mobile user who wishes to avail himself of the numerous services-which may be transmitted on not only different frequency bands, but via different modulation methods-the portable would be very complex and accordingly expensive.

We anticipate that all mobile services will convey the data in encrypted packetized formats. The packets will be, in general, conveyed via optical fiber networks, although there may be a role to play for point-to-point high frequency links such as those at 60 GHz [28]. The packetized data will be conveyed to the mobiles via carrier frequencies generally below 4 GHz, although higher frequencies may be adopted [29]. Satellite services will only be necessary for mobiles in remote places.

To end this discourse, we offer a long-term view for communications to aircraft. Satellites cost tens of millions of dollars to put into orbit, have limited channel capacity, and introduce inherent long delay times in aeronautical communications. An alternative is to use the radar tracking of aircraft to facilitate high data rate ground/air transmissions in the 40 GHz band. When the aircraft fly over the oceans, unmanned maritime vessels (that provide maritime navigation aid), held on station by power generated from the waves, could form conical radio cells with a base of, say, 50,000 ft and truncated at, say, 20,000 ft. The vessels would need to be spaced apart by some 350 miles and linked by a submarine optical LAN whose main teletraffic would be transatlantic. The vessels would send and receive high capacity data via radio, to and from the moving "aircraft

picocells." The aircraft passengers would communicate via the aircraft BS using their communicator terminal in front of their seat, and the aircraft would transmit and receive their signals from the maritime vessel acting as an MSC. Although these notions are futuristic, they do represent part of another picture, the eventual colonization of the seas and all their resources.

"Portable Digital Radio Communications—An Approach to Tetherless Access," Donald C. Cox, IEEE Communications Magazine, July 1989.

The confluence of VLSI digital technology, cellular mobile radio technology, and intelligent network technology with recent research results on multipath radio propagation and TDM/TDMA radio technology makes low-power personal portable radio appear to be an attractive adjunct to today's wireline loop technology, and one which offers a powerful response to the growing customer demand for tetherless communications. The integration of low-power exchange-access digital radio with network intelligence could provide more flexible, widespread tetherless portable communications than can be provided by today's more limited portable communications approaches. Local exchange network distribution and intelligence could readily and economically provide the extensive infrastructure needed for such a widespread low-power system. It should be recognized that two separate radio systems are required to serve the different needs of high-power vehicular users and low-power handheld personal users, and that two separate blocks of frequencies must be assigned. A nationwide (and perhaps worldwide) radio system plan is needed to permit the use of any low-power handheld voice and/or data set anywhere. The plan should recognize the enormous economic and service advantages of a network solution for personal portable radio, which would provide for a standardized system with nationwide or even worldwide compatibility, and which would utilize the existing network infrastructure to the greatest possible extent. While people seldom take their automobiles with them on transcontinental travel, pocket radio telephones would be useful in such far-ranging travel. Thus, worldwide standardization appears considerably more desirable for low-power portable communications systems than for high-power vehicular systems. Modern technology can provide truly ubiquitous, worldwide, exchange-network-based tetherless voice and data communications, when and if the electropolitical and regulatory hurdles can be overcome.

"A Systematic Approach to Carrier Recovery and Detection of Digitally Phase Modulated Signals on Fading Channels," Reinhold Haeb, and Heinrich Meyr, IEEE Trans. Communications, Vol. 37, No. 7, July 1989.

Carrier phase synchronization is a major problem for coherent data communication over frequency-nonselective fading channels due to the rapid phase fluctuations on these channels. This paper examines the problem of optimal carrier recovery and detection in the following way. First, the optimal receiver is derived for digitally phase modulated signals when transmitted over a frequency-nonselective fading channel with memory. The memory results from the fact that usually the coherence time of the channel is larger

than the symbol period. Symbols adjacent in time cannot be detected independently and therefore the well-known quadratic receiver is not optimal in this case. The MAP detector derived in this paper explicitly exploits the channel memory for carrier recovery. The derivation shows that the optimal carrier recovery is, under certain conditions, a Kalman filter. Some attractive properties of this carrier recovery unit (one of them is the absence of "hang-up") are discussed. Then the error rate of several digital modulation schemes is calculated taking the performance of the filter into account. The differences in susceptibility of the modulation schemes to carrier phase jitter are specified.

"Critical Connectivity Phenomena in Multihop Radio Models," Yuan-Chieh Cheng and Thomas G. Robertazzi, IEEE Trans. on Communications, Vol. 37, No. 7, July 1989.

The percolation of a broadcast in a multihop radio network modeled by a spatial Poisson process is studied. The effect of station density and transmission radius on the extent of broadcast percolation is examined. For broadcast percolation in one spatial dimension, analytical expressions for the average extent of percolation are derived. A model for two dimensional spatial percolation is presented along with related simulation results.

"Probability of Error for Selection Diversity as a Function of Dwell Time," Johannes H. Barnard, and Christoff K. Pauw, IEEE Trans. on Communications, Vol. 37, No. 8, August 1989.

The probability of error for an Nth order selection diversity system is investigated for the case where the receiver is forced to dwell on one channel for several symbols before being allowed to make a new decision regarding the best channel. It is found that the time-varying nature of a fading channel causes significant degradation of the probability of error when the dwell time becomes longer than about ten percent of the inverse of the fading bandwidth of the channel. The onset of degradation is a function of the signal-to-noise ratio and of the order of diversity.

"Packet Reservation Multiple Access for Local Wireless Communications," D. J. Goodman, R. A. Valenquela, K. T. Gayliard, and B. Ramamurthi, IEEE Trans. on Communications, Vol. 37, No. 8, August 1989.

Packet reservation multiple access (PRMA) allows a variety of information sources to share the same wireless access channel. Some of the sources, such as speech terminals, are classified as "periodic" and others, such as signaling, are classified as "random." Packets from all sources contend for access to channel time slots. When a periodic information terminal succeeds in gaining access, it reserves subsequent time slots for uncontested transmission. Computer simulations and a listening test reveal that PRMA achieves a promising combination of voice quality and bandwidth efficiency.

"Performance of Optimum Threshold Incoherent Diversity in Non-Gaussian Noise and Fading," A. M. Maras, and C. E. Goutis, IEE Proceedings, Vol. 136, Pt. I, No. 4, August 1989.

The optimum diversity receiver in arbitrary non-Gaussian noise and Rayleigh fading statistics is derived for binary narrowband correlated symmetric incoherent sig-

nalling in the threshold regime, i.e., for small signals and independent noise samples. Its performance is obtained in terms of the error probability P_e for various values of a specific signal crosscorrelation coefficient ρ and multichannel order, when fading in the channel is assumed to be slow, nonselective Rician or Rayleigh. This expression for P_e is shown to be a generalization of a recent performance result in optimum threshold detection of incoherent narrowband signals in narrowband non-Gaussian noise. It is graphically demonstrated that the best signalling in Rayleigh fading is orthogonal ($\rho = 0$) and that performance significantly improves as the diversity order increases for fixed sample size $N (\gg 1)$ and second-order noise statistic $L^{(2)} (\geq 1)$. A novel by-product of the analysis is the error probability expression of the single-channel threshold incoherent receiver with Rician fading, which is used to graphically demonstrate that the signalling scheme which optimizes, i.e., gives the minimum possible value of P_e , is also orthogonal.

"Design of Coded CPFSK Modulation Systems for Bandwidth and Energy Efficiency," Bixio Rimoldi, IEEE Trans. on Communications, Vol. 37, No. 9, September 1989.

This paper is concerned with problems related to the design of M-ary continuous-phase frequency-shift keying (CPFSK) systems with modulation index $h = J/M$, combined with external rate r binary convolutional encoders. The following questions are raised and answered: 1) how should different encoder-modulator systems be compared and how can comparable systems be recognized from the system parameters, i.e., M, h , and r ?; 2) what are the limits on the information rate per unit bandwidth, versus signal-to-noise ratio, when reliable transmission is required?; 3) how does one choose the system parameters, M, h , and r when the overall system has to achieve a specified performance?; 4) how does one design the external rate r binary convolutional encoder to put in front of the M-ary CPFSK modulation system with $h = J/M$? A simple approximation for the bandwidth of a CPFSK signal is given and shown to be sufficiently accurate for system design purposes. The design of the external convolutional encoder is carried out in a novel way that leads to fewer states in the combined encoder-modulator system and thus yields improved performance for a given demodulation-decoding complexity compared to previous approaches for the design of coded CPFSK systems. Specific optimum convolutional encoders for CPFSK are derived by application of Ungerboeck's set-partitioning approach.

"Adaptive Channel Estimator for an HF Radio Link," A. P. Clark and S. Hariharan, IEEE Trans. on Communications, Vol. 37, No. 9, September 1989.

Several channel estimators have been developed over the past few years for use in serial digital modems that operate over voiceband HF radio links. A simple estimator designed for a 2400 bit/s modem is a development of the conventional gradient estimator, and employs a polynomial filter that gives a prediction of the channel response. An improved estimator designed for a 9600 bit/s modem is much more sophisticated, and uses the techniques of the simple estimator together with a knowledge of the number of different paths (separate sky waves) in the HF radio

link. The paper describes some new estimators, that are developments of the simple estimator but make no use of any knowledge of the number of different paths. The new estimators have performances intermediate between those of the simple and improved estimators, but are only a little more complex than the simple estimator. The new estimators are studied for a particular QPSK modem that operates at 4800 bit/s over voiceband HF radio links. Results of computer simulation tests are presented, comparing the accuracies of the channel estimates given by different estimators, and hence suggesting the most suitable of these.

"Power Suppression at the Nyquist Frequency for Pilot-Aided PAM and QAM Systems," Dae Young Kim and Kamilo Feher, IEEE Trans. on Communications, Vol. 37, No. 9, September 1989.

Two low redundancy codes for in-band pilot insertion are introduced. One named KF10 suppresses the baseband PAM and the modulated QAM signal power at the Nyquist frequency so that the dual pilot tone calibration technique of recent interest can be arranged to convey both a symbol timing and a carrier reference to the receiver. The other named OF00 suppresses the signal power at zero as well as the Nyquist frequency, and enables the utilization of a triple-pilot scheme which provides, in addition to a symbol timing, a carrier reference with no 180° phase ambiguity.

YOU SAID WHAT?

I said, "Don't you know someone deserving of the Avant Garde Award?"

What's an Avant Garde, you say? Webster's New Collegiate Dictionary defines it as:

"In any art, the most daring of the experimentalists and innovators of original and startlingly unconventional designs, ideas, or techniques during a particular period."

It is the name of an award of the Vehicular Technology Society in

"recognition of those who, for their pioneering, leadership, and continuing contributions in promoting new technology in the field of vehicular communications and electronics."

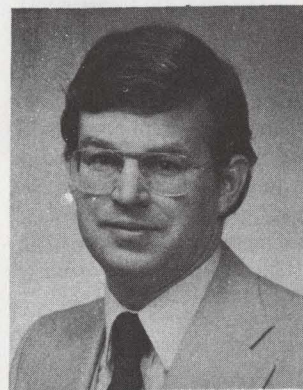
The award consists of a certificate and medal.

Surely, you know someone in the Society who is deserving of the recognition of being a member of the Avant Garde.

So why not take a few minutes and complete and mail the form enclosed with this Newsletter.

The Avant Garde Committee
Dr. Arthur Goldsmith
Mr. Robert Mazzola
Mr. Sam McConoughey, Chairman

Vehicular Electronics

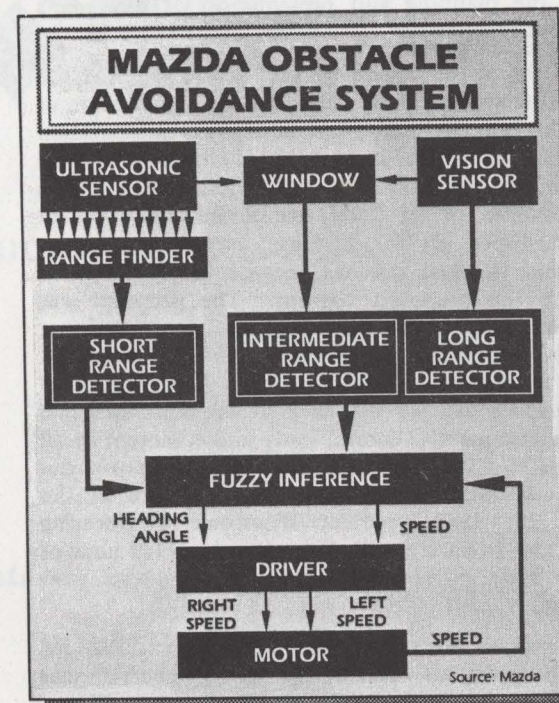


Bill Fleming
Vehicular Electronics Editor

COMPARISON OF SENSOR TECHNOLOGIES USED IN INTELLIGENT VEHICLE/HIGHWAY PROGRAMS

During the past few months, many different types of sensor technologies have been proposed for use in intelligent vehicle/highway programs. A convenient summary of these technologies is provided here.

Sensor Technology	Application(s)	Under Investigation By	[Refs.]
millimeter-wave radar	vehicle station-keeping (cruise control), and braking	Radar Control Systems, San Diego; and University of California, Berkeley, CA	[1]
infrared scanning	high-speed vehicle station keeping, and for enhanced night vision	University of California, Berkeley, CA; General Motors Hughes Electronics	[1, 5]
low-frequency embedded wire 10-kHz radio signals in roadway	vehicle self guidance and use of narrower traffic lanes	Caltrans Laboratories	[1]
magnetic nails embedded in roadway	vehicle guidance and coded roadway information	University of California, Berkeley, CA	[1]
ultrasonic sonar	blind-spot vehicle detection during lane changes	Computer Sonics Inc., Irvine CA; Indian Valley Manufacturing, Telford, PA; BATS Inc., Indianapolis, IN; Polaroid Corp	[1, 4, 9]
scanning laser beams	autonomous land vehicle (ALV), automated vehicle control	Martin Marietta, DARPA, and University of Michigan-ERIM	[2]
ultrasonic sensor, vision, and fuzzy logic	vehicle obstacle avoidance and real-time autonomous navigation	Mazda Motor Corporation, Technical Research Center	[3]
optical-fiber remote vision	obstructed rear-view and blind-spot driver vision	Poly-Optical Products, Santa Ana, CA; Clarion/Nissan, Lawndale, CA; Schott Fiber Optics, Southbridge, MA	[6, 7]
video (vision) sensor	precise lane guidance, crash avoidance, and future automatic vehicle control	General Motors Trilby Vehicle Systems Development; Electro-Technical Lab, Tokyo; Univ of Maryland; Nippondenso; and Volkswagen R&D	[8]



Mazda Ultrasonic/Vision Sensing Fuzzy-Logic Obstacle Avoidance System [3]

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[Editor's note: Although the deadline for submission of abstracts has passed for the following call for papers, we wanted to include it for your information.]

IEEE
Vehicular Technology Society
Land Transportation Division

CALL FOR PAPERS

IEEE VEHICULAR TECHNOLOGY CONFERENCE

May 7-9, 1990
Orlando, Florida

The Land Transportation Division of the IEEE Vehicular Technology Society is seeking abstracts for technical papers to be considered for presentation and discussion at this conference.

Papers which review topics of current interest in the areas of system design, hardware development, and transportation technology advances with the aim to improve the operation of railroad and transit systems, and increase their cost-effectiveness, are being sought. Topics can include:

- o Control Systems
- o Traffic Monitoring
- o Vehicle Location
- o Maglev
- o Electromagnetic Compatibility
- o Headway Management

Authors are requested to submit five copies of the abstract for their proposed paper by September 30, 1989 to:

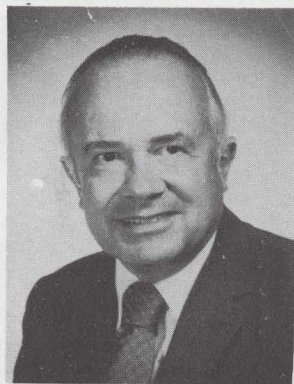
Roger M. Avery
Meetings Chairman, Land Transportation Committee
Manager Systems Engineering
LS Transit Systems, Inc.
1515 Broad Street
Bloomfield, NJ 07003

Selected papers are to be submitted on IEEE "Authors Kit" format by December 15, 1989. For further information, call Roger Avery at: (201) 893-2848.

Call For Papers: IEEE Vehicular Technology Conference, May 7-9, 1990, Chicago, IL. The Land Transportation Division of the IEEE Vehicular Technology Society is seeking abstracts for technical papers on system design, hardware development, and transportation technology advances to be considered for presentation and discussion at this conference.

Authors are requested to submit five copies of the abstract for their proposed paper by September 30, 1989. Selected papers are to be submitted by December 15, 1989. For further information, contact Roger Avery, LS Transit Systems, Inc., 1515 Broad Street, Bloomfield, NJ 07003. Telephone (201) 893-2848.

Professional Activities



Frank E. Lord
Professional Activities Editor

role in the planning and presentation of this year's PACE Workshop.

One of the major topics of the Workshop was the proposed restructuring of the volunteer organization of the Institute. Originally scheduled as a presentation and discussion of one hour by USAB Chairman Dr. Ed Bertnolli, interest was such that additional meetings were arranged. Wally Reed, one of the candidates for President-Elect of the Institute, was a prominent participant in these sessions because of his extensive work on the proposed concept. The proposal was presented in rather general terms and it was stated that details would be worked on over a period of time that would be a year or more. Every detail will have consequences that we will have to live with for some time. Consequently, careful study and comment by all members was solicited. For the time being you can obtain additional information from page 16 of the August 28, 1989 issue of Electronic Engineering Times, and pages 1 and 7 of the October 1989 issue of The Institute. The latter specifically requests your comments.

Theme presentations were given as luncheon talks. Ed Bertnolli spoke on "Our Image as Engineers-Should We Change Our Name". Dr. Bertnolli suggested that the unfortunate quirk of English that relates the word for a type of machine with the word that describes the people that translate scientific principles into systems and devices that serve man may contribute to our unclear image in the eyes of the public. Other languages including Latin and most of those derived from it do not have this undesirable feature.

On the second day, Dr. Bruce Lewenstein, Assistant Professor in the Communication Department of Cornell University, spoke on "Frankenstein or Wizard: Images of Engineers in the Mass Media". With specific examples from various media, Dr. Lewenstein has studied the subject extensively and interested members would find his related articles worthwhile.

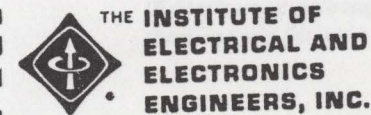
The IEEE-USA Legislative Agenda, Industry Outlook, Employment Matters and our Observance of National Engineers' Week 1990 were topics that rounded out the PACE Workshop. Considerable concern was voiced from the floor about some of the Engineers Week publicity material prepared by some other participating societies that made sweeping statements about anticipated engineering shortages. These statements do not agree with the results of our Institute's studies and we are now attempting to eliminate the introduction of such questionable ideas into what is supposed to be a celebration of the accomplishments of engineers.

Members desiring further information of any of the Workshop topics may contact the IEEE-USA office, 1111 19th Street N.W., Washington, D.C. 20035, phone (202) 785-0017. You may also contact you Group Chapter, Section or Society PACE Chairman.

PACE WORKSHOP REPORT

I participated in the annual PACE (Professional Activities Committees for Engineers) Workshop held on Labor Day weekend in Burlington, Vermont. The theme this year was "Engineering in the Public Eye". Among the participants were several of our VTS colleagues including President George McClure, Art Goldsmith, Director of Division VI, Hal Bloomberg and Bill Whipkey. In a session on "Pensions, Early Retirement and Age Discrimination," George McClure gave a presentation on "Understanding your Pension". Later he led a training session on the same subject. Bill Whipkey chaired a session on Employment Matters as well as leading a discussion on "How to Run a Career Assessment and Planning Workshop that Results in Positive Commitments Toward Setting and Meeting Individual Goals."

The morning before the PACE Workshop got underway, I participated in a meeting of the PACE Divisional Activities Committee (PACE/DAC), that segment of the PACE organization that couples the interests of the Divisions and Societies with the responsibilities of the United States Activities Board (USAB). In keeping with the fact that there are many facets to our professional lives, the institute is a multi-dimensional matrix organization. Two of the dimensions are technical and professional. The technical structure includes all the specialties represented by the more than thirty fire Societies. The professional dimension includes our interfaces with government and other entities of American Society, as well as our attention to career related factors. The PACE Divisional Activities Committee under the leadership of Jim Strother has recently been experiencing an increased level of activity in promoting greater participation with the Societies including work on funded projects. PACE/DAC also had a significant



RECOMMENDATION FOR VEHICULAR TECHNOLOGY SOCIETY AWARD

(See Awards Summary)

- FIELD: Automotive Electronics
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Professional Activities Editor

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[Editor's note: Although the deadline for submission of abstracts has passed for the following calls for papers, we wanted to include them anyway for your information.]

IEEE
Vehicular Technology Society
Land Transportation Division

CALL FOR PAPERS
ASME/IEEE JOINT RAILROAD CONFERENCE

April 17-19, 1990
Chicago, Illinois

The Land Transportation Division of the IEEE Vehicular Technology Society is seeking abstracts for technical papers to be considered for presentation and discussion at this conference.

Papers which review topics of current interest in the areas of system design, hardware development, and transportation technology advances with the aim to improve the operation of railroad and transit systems, and increase their cost-effectiveness, are being sought. Topics can include:

- o AC and DC propulsion systems
- o Electromagnetic compatibility
- o Automation and microprocessor control
- o Signal and communication system innovations
- o Maintenance procedures, monitoring and fault detection
- o Safety and assurance programs
- o High speed transportation systems
- o Magnetic levitated systems
- o Transportation systems, the next generation
- o People mover systems
- o Traction electrification system alternatives
- o Energy efficient systems and energy conservation methods
- o New transit system starts
- o Computer modeling and simulation of transportation systems

Authors are requested to submit five copies of the abstract for their proposed paper by September 30, 1989 to:

Roger M. Avery
Meetings Chairman, Land Transportation Committee
Manager Systems Engineering
LS Transit Systems, Inc.
1515 Broad Street
Bloomfield, NJ 07003

Selected papers are to be submitted on IEEE "Authors Kit" format by December 15, 1989. For further information, call Roger Avery at: (201) 893-2848.

Call for Papers : IEEE/ASME Joint Railroad Conference, April 17-19, 1990, Chicago, IL. The Land Transportation Division of the IEEE Vehicular Technology Society is seeking abstracts for technical papers on system design, hardware development, and transportation technology advances to be considered for presentation and discussion at this conference.

Authors are requested to submit five copies of the abstract for their proposed paper by September 30, 1989. Selected papers are to be submitted by December 15, 1989. For further information, contact Roger Avery, LS Transit Systems, Inc., 1515 Broad Street, Bloomfield, NJ 07003. Telephone (201) 893-2848.

Call for Papers

ASCE-sponsored session at the ASME/IEEE Joint Railroad Conference in Chicago, Illinois, April 17-19, 1990

Sponsor: High Speed Ground Transportation (HSGT) Committee of ASCE's Urban Transportation Division

Background: High speed ground transportation (HSGT) systems are currently being actively considered or planned for in several U.S. corridors using technology developed overseas. HSGT systems must be planned and designed comprehensively and in a way that coordinates and integrates all elements, including track/guideway, bridges/viaducts, tunnels, vehicles, propulsion and control systems, electrification, signaling and communications. The interaction between vehicles and track/guideway is particularly important to plan and must be accurately predicted and controlled. Much research and testing has been conducting in overseas applications. Now that these systems are being considered for U.S. application, it is important for North American planners, designers, builders, and suppliers to become aware of the issues and tradeoffs involved in this field.

Session Purpose: To bring together mechanical and electrical engineers with expertise in HSGT vehicle design with civil engineers experienced in planning, designing and constructing track/guideway structures and foundations to address the interaction between HSGT vehicles and permanent way.

Paper Topics: Multi-dynamic loadings of foundations; soil dynamics and vibration; aerodynamics of HSGT tunnels and structures; track/train dynamics; effect of guideway and catenary system design/maintenance standards on energy consumption, train performance and maintenance cost; noise and vibration mitigation measures in the design of HSGT systems; systems engineering considerations in the design of guideway and/or vehicle suspension systems; and HSGT design, operations, and maintenance experience (Europe and Japan).

Deadlines: September 30, 1989 for 500 word abstract. Authors will be notified by October 30, 1989 as to acceptance, and papers will be due by January 15, 1990 for publication prior to the conference.

Contacts: Send abstracts to Mr. John A. Harrison, Parsons Brinckerhoff Quade & Douglas, Inc., 26 Journal Square, 14th floor, Jersey City, NJ 07306; tel. (201) 656-1600. For other information on the ASME/IEEE conference, contact Mr. John Penwani of AAR at (312) 567-3601.

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