Dallas—Site of 1986 Annual VTS Conference
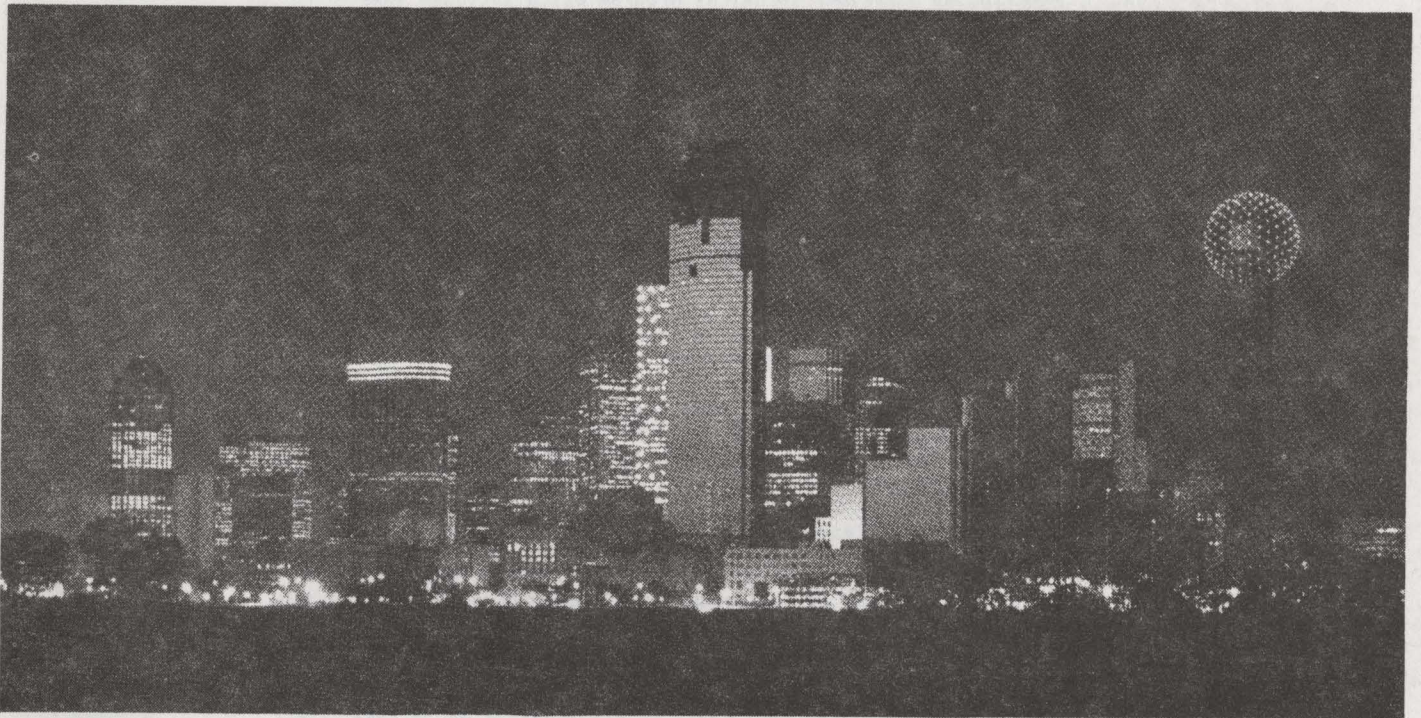
Be there May 20-22!

President's Message

Robert Fenton
President
IEEE Vehicular Technology Society

At your Board of Directors' meeting in December, we reviewed our 1985 accomplishments and our plans for 1986. While '85 was a good year for the Society, our expectation is that '86 will be even better for the following reasons:

(a) Our Vehicular Technology Conference in Dallas next May 20-22, has compiled an excellent technical program which includes some outstanding panel sessions.

(b) "Propagation at 800-947MHZ" will be the focus of a special issue of our transactions which is tentatively planned for November. This will indeed be something special as we have an extremely well-qualified list of contributors who have been working and meeting for many months to ensure an outstanding issue.

(c) The Society is cosponsoring the Joint Railroad Conference in Norfolk, Virginia, April 7-8--an event which should be of high interest to our transportation members.

(d) Convergence '86, which we'll cosponsor with SAE this year, promises to be the big vehicular electronics event of the year. Its scope is such that is should be of interest to all VTS members.

Some additional details on these and other items of interest are contained in the minutes of the Board meeting which are reprinted in this Newsletter. Please take time to read them and keep informed about our activities as they do affect you--our members!

In the very near future, you will receive the preliminary conference program and registration information for VTC '86 in Dallas. In addition to the technical program mentioned above, the conference facilities are first rate at moderate prices, and Al Markwardt and his committee are working hard to insure that VTC '86 will be a memorable event. You won't want to miss this one, so send in your reservations early.

Your Board of Directors will meet in Washington, D.C. shortly after you receive this issue. If you have any ideas or thoughts you would like presented or discussed, please contact one of the board members.

Best wishes for a successful 1986.
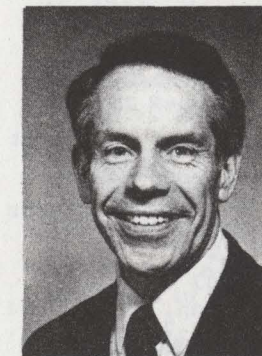
Respectfully submitted,

Bob

Robert E. Fenton

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Newsletter Deadlines

Month of Issue	Final Copy to be Rec'd By VTS Editor	Target Mailing Date
May	3-10-86	04-14-86
August	6-09-86	7-13-86
November	9-13-86	10-15-86
February	12-30-86	01-27-87

Editor's Notes

A. Kent Johnson
Newsletter Editor

New VT Fellows

We would like to extend sincere congratulations to three members of IEEE/VTS who were recently elected to Fellow Grade in the IEEE. They are:

John H. Davis
AT&T Bell Laboratories
For leadership in the field of digital switching

Robert E. Fenton
Ohio State University
For contributions to control systems for automatic control of high-speed highway vehicles

Michio Takaoka
Fujikura Cable Works Limited
For contributions to theoretical design and development of high-voltage cable

We are proud to have these individuals as members of VTS and congratulate them on their accomplishment.

Society Officers and Board of Directors

SOCIETY OFFICERS

Society President	Society Vice President	Society Secretary	Society Treasurer
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BOARD OF DIRECTORS

NAME	RESPONSIBILITY	TERM ENDS
Robert E. Fenton	President	Dec85
Arthur Goldsmith	Treasurer	Dec87
Al Goldstein	Conference Coordinator	Dec86
A. Kent Johnson	Newsletter Editor	Dec86
Samuel A. Leslie	Society Secretary	Dec86
Fred M. Link	Chairman, National Site Selection Comm.	Dec86
Charles Lynk	Chairman, Paper of Year Comm.	Dec85
Roger Madden	Vice President	Dec87
Robert A. Mazzola	Chairman, Membership Committee	Dec87
George F. McClure	Chairman of Publications Comm. and Transactions Editor	Dec85
Samuel R. McConoughey	Immediate Past President	Dec86
Stuart Meyer	Senior Past President	Dec85
William Misskey	Canadian Editor, Newletter	Dec87
Evan B. Richards	National Conference Coordinator	Dec87
Eric Schimmel	Chairman, Personal Radio Committee	Dec85

Board of Directors Report

Samuel A. Leslie
VTS Secretary

TO: IEEE VTS Board of Directors
    VTS Chapter Chairmen

A VTS Board of Directors meeting was held at the Embassy Suites Hotel in Washington, D.C., on December 11, 1985. The meeting was called to order at 9:00 AM, with the following in attendance:

Bob Fenton	President
Roger Madden	Vice President
Art Goldsmith	Treasurer
Stuart Meyer	Senior Past President
Sam McConoughey	Junior Past President
Eric Schimmel	Personal Radio Chairman
Bob McKnight	VTS Publicity Chairman
Sam Leslie	Secretary
Bill Misskey	Vehicular Electronics Editor
George McClure	Publications Chairman
Gaspar Messina	Chapter Activities Chairman
Evan Richards	National Conference Coord.
Fred Link	National Conf. Site Sel.
Kent Johnson	VTS Newsletter Editor
Neal Shepherd	VTS Propagation Comm. Chmn.

Twelve of the 15 elected Board members were present for this meeting. A quorum was thus present for voting on matters before the Board.

Evan Richards moved, Kent Johnson seconded that the minutes of the last full Board meeting (May 20, Boulder) be approved as published. Likewise, Sam McConoughey moved, Evan Richards seconded that the minutes of the September 12 Executive Committee meeting also be approved. Both motions carried with votes unanimous in favor.

TREASURER'S REPORT

Art Goldsmith reported that the Society finished the 1984 year with a surplus of $18,900, and that 1985 is in good shape with a surplus of about $75,000 above the budgeted amount. He also stated that there are no outstanding conference loans at present.

Evan Richards moved, George McClure seconded that the Treasurer's report be accepted as submitted. The vote was unanimous in favor.

CONFERENCE COMMITTEE REPORT

Evan Richards reported on the status of the following conferences:

Convergence: A final report dated November 30, 1985 for the '84 Convergence Conference has been received. Transfer of the books to the '86 Convergence Committee and a final financial statement is anticipated by January 7.

VTC/Boulder: Attendance at this conference was 256, and the final report, financial report, and summary status have been submitted. Boulder closed out with a nominal surplus of $6,000.

VTC/Dallas: Abstracts for 41 papers have been received, with at least another 20 or so anticipated within the next few weeks. The deadline for abstract submission has been extended to January 15, 1986. More abstracts are being solicited in the areas of Transportation Systems and Vehicular Electronics. Also, panel discussions in the areas of RF Propagation, International Communications, and FCC Regulatory issues are under consideration.

VTC/Tampa: A budget and projected cash-flow analysis is needed to proceed with seed money for the 1987 Tampa Conference. Evan Richards moved, Sam McConoughey seconded that preliminary seed money of up to $1,000 be advanced to the Tampa Conference Committee on an as-needed basis. Vote was unanimous in favor.

VTC/Philadelphia: Dates for the 1989 Conference are still under consideration.

VTC/1990: Fred Link reported that the current possibilites are Orlando, Washington DC, and perhaps Chicago. The Board indicated that Fred should continue with these possibilities, with letters of interest to be solicited from these regions.

EIA LAND MOBILE SHOWCASE

Eric Schimmel reported that Hurricane Gloria had seriously impacted the 1985 EIA Land Mobile Showcase conference in September. He reported that they are not anticipating a 1986 conference at this time, due primarily to too much competition from other conferences in the same time period.

RECOGNITIONS

The Board unanimously recognized Sam McConoughey for his chairing of a panel titled "The Technology of the 90's - Moving from Analog to Digital" at the EIA 1985 Land Mobile Showcase.

Also, the Board congratulated Bob Fenton on his advancement to the IEEE Grade of Fellow.

Sam McConoughey presented an award to Stu Meyer for services rendered during his term as president of the VTS Society.

Stu Meyer announced that he has in process two new Avant Garde awards for VTS members in the automotive industry. A total of 47 Avant Garde awards have been made to date.

Stu Meyer moved, Fred Link seconded that a letter of appreciation and a plaque be presented to Edward Czapor for his contributions as chairman of the '84 Convergence conference. The vote was unanimous in favor.

Sam McConoughey moved, Fred Link seconded to give Dorcus and Laura Murray a small memento for their efforts with the Boulder women's program and overall assistance with the conference itself. The vote was unanimous in favor.

PUBLICATIONS REPORT

George McClure announced that Dick Uher has accepted the position of "Associate Transportation Editor" for the VTS Transactions. Also, the August 1985 issue is at the printers, and should be in the mail before the end of the year. Future issues will be back on track with the normal quarterly schedule.

The 1986 Transactions page budget has been submitted for a total of 350 pages.

The November 1986 issue is scheduled as a special RF Propagation Issue, with the results of Neal Shepherd's RF Propagation Committee work slated for publication in this issue.

George McClure noted that the more successful VTS transactions have been those where a specific topic and a guest editor have been identified. He is to pursue this in the future.

Kent Johnson reported that IEEE HQ has been very responsive in getting the VTS Newsletter published and mailed in a timely manner. The price schedule for ads in the Newsletter was published in the last issue, but so far there has been no response.

Bob Fenton reported that he had requested an ad for the upcoming February 1986 issue of the IEEE Student Potentials Magazine, with the ad to cost $400. The Board noted that the Publications Chairman should include ads in support of this magazine in the publications budget. On a similar matter, Bob Fenton approved an appropriation for $200 to the IEEE Student Year Book for 1985.

Bill Misskey moved, Roger Madden seconded that the President be given continuing authority to support the Student Year Book.

NOMINATIONS COMMITTEE REPORT

Stu Meyer reported that the following have agreed to run for election for the upcoming Jan-1986/Dec-1988 term:

Bob Fenton
Leo Himmel
Charles Lynk
George McClure
Stuart Meyer
Eric Schimmel
Vino Vinodrai

Stu Meyer moved, Fred Link seconded that the above slate of candidates be accepted. The vote was unanimous in favor. Ballots are to be mailed to the membership for voting on January 16.

Sam McConoughey is to take over the Nominations Chairman position next year.

MEMBERSHIP

Sam McConoughey reported on the recently published membership brochure for VTS. There was no report from the Membership Committee Chairman at this meeting.

INFORMATION & TELECOMMUNICATION POLICY

Eric Schimmel reported on a current FCC Docket (85-171) regarding an "alternative type acceptance" (ATA) procedure for non-conventional land-mobile modulation schemes. Stu Meyer noted that the policy appears primarily aimed at the current dilemma of licensing ACSB systems, in that the FCC does not have a formal type acceptance procedure for this service. An EIA response to this docket points out some technical shortcomings of this procedure, while being generally in favor of its intent.

USAB COMM. ON COMM. & INFORMATION POLICY

Eric Schimmel reported on the latest from the USAB in regard to the Communications Privacy Act of 1985, and noted that the November 13, 1985 position report submitted by L. W. Ellis of USAB indeed is not in agreement with the views of EIA and probably most members of VTS. He noted that EIA feels it is a bad law in that it is difficult to legislate (enforce) privacy.

Sam McConoughey moved, Kent Johnson seconded that the VTS continue to participate in the CCIP by submitting technical data to this committee. The Board vote was unanimous in favor. The Board appointed Eric Schimmel to forward the technical issues of concern (i.e., any TV set can intercept conversations on the cellular band) to this committee in a timely manner.

DAN NOBLE AWARD

Bob Fenton reported that the latest thinking is that Motorola and the VTS increase their respective investments by perhaps $15,000 to allow a yearly scholarship in the range of $7,500 to be awarded. After discussion, the Board decided to defer the matter until the next meeting. Al Goldstein is to bring a more firm proposal before the Board.

The Board had a question regarding the period for which the original scholarship fund was authorized. Upon checking the 1981 VTS minutes, a mail ballot dated June 23, 1981 was approved which provided for a period of five years commencing with the first award that the Society would make. Thus, the Board must reauthorize the scholarship fund in 1987, as well as consider increasing the fund amount.

TRANSPORTATION SYSTEMS

Bob McKnight, representing Tony Eastham, announced a joint Railroad/ASME Conference that is being held April 9/10 1986.

Bob Fenton noted that both he and Tony Eastham had individually sent out approximately 500 letters each to those LTC members of IAS that are not current members of VTS. This letter was to inform the LTC members that their committee had been transferred to VTS. Bob noted that there had been a noticeable increase in VTS membership in October, but that the Board will have to wait until after the first of the year to determine the effect of the mailings.

Bob Fenton also announced that VTS has been invited to co-sponsor a joint VTS-LTC Conference at the Mayport Hotel in Vancouver (May 14-16, 1986). The theme of this conference is "International Conference on MagLev and Linear Drives", and is being held in conjunction with Expo 86. Since there was no information regarding financial exposure, cost of publications, or needed financial assistance, Evan Richards is to contact Tony Eastham to resolve some of these issues. Bill Misskey moved, Evan Richards seconded that VTS co-sponsor this conference. The Board vote was unanimous in favor. Additional Board action will be required to resolve the financial assistance issue.

SUPPORT OF THE CONVERGENCE CONFERENCE

Bob Fenton reported on his attendance at the 4th Planning Session of the Convergence '86 Conference Committee. He noted that the preparations are proceeding smoothly because of committed leadership and an experienced committee.

Roger Madden has been assigned to investigate the feasibility of a scholarship in automotive electronics as one possibility for supporting this conference. Other possibilities were discussed, with Roger Madden making a motion that the President of VTS be directed to take at least three alternatives to the Convergence Conference Committee to seek their guidance on how the VTS should share Convergence funds for present and future conferences. Bill Misskey seconded the motion, and the vote was unanimous in favor.

IEE CONF. ON AUTOMOTIVE ELECTRONICS

The Society has received an invitation to be associated with the "Sixth International Conference on Automotive Electronics" to be held October 27-30, 1987 in Birmingham, England. Sam McConoughey moved, Roger Madden seconded that the Board accept the IEE invitation to participate in this conference. The Board vote was unanimous in favor. Kent Johnson has agreed to be the VTS corresponding member, and Sam Leslie is to write a letter to the IEE Conference Committee accepting their invitation.

PUBLICITY REPORT

Bob McKnight announced that publicity releases have been mailed in regard to the Dallas conference. Bob is to get with Fred Link re further publicizing in some of the industry journals.

CHAPTER ACTIVITIES

Gaspar Messina submitted a written report in which he discussed the continuing problem of Chapter Chairmen not submitting reports of meeting activities or election results. He has started a telephone campaign, in which he has been successful in contacting nine of the chapters to date. It was also mentioned that their have been problems in getting the various IEEE Sections to forward the IEEE L31 forms to the various chapter chairmen.

PROPAGATION COMMITTEE REPORT

Neal Shepherd reported that his committee has had nine meetings this year. They are targeting the upcoming November issue of the VTS Transactions for publication of their results.

Also, the sponsoring of an RF Propagation Workshop at the Dallas Conference is under consideration. Stu Meyer moved, George McClure seconded that the VTS fund no more than two people transportation at the lowest commercial fare to the Dallas Conference to participate in the RF Propagation Workshop. The vote was unanimous in favor.

Sam McConoughey submitted a written motion to the Board which in effect stated: "Any person who has actively participated in at least four meetings of the propagation committee shall be eligible to receive an institutional listing in the Society's newsletter free of charge. The number of consecutive institutional listings for which a participant qualifies is as follows:

4 to 7 meetings - - - - 4 consecutive listings
8 to 11 meetings - - - 8 consecutive listings
12 or more meetings- - -12 consecutive listings

All applications by eligible participants must be made no later than March 1, 1986." Roger Madden seconded the motion, and the vote was unanimous in favor.

MILESTONES PROGRAM

Sam McConoughey reported that three VTS Milestone candidates are being investigated:

1. The first use of land mobile receivers by the City of Detroit Police Department in 1921.

2. The first use of amplitude-modulated (AM) two-way land mobile radio by the Bayonne, NJ police department.

3. The first use of frequency-modulated (FM) two-way land mobile radio by the State of Connecticut State Police Department.

Nomination forms have been forwarded to local contacts in each of these areas.

CONSTITUTION AND BYLAWS COMMITTEE

Roger Madden submitted the latest revised version of the VTS Constitution, and requested that the Board review the revisions and submit comments no later than 30 days before the next board meeting.

PROFESSIONAL ACTIVITIES

A written report submitted by Frank Lord, in which he reports on his participation at the August 30 PACE Conference. Of particular interest is the emphasis of creating closer ties between USAB and PACE. Bob Fenton noted that Frank has been a pioneer in reporting professional activities in the VTS Newsletter, and has an article submitted for publication in the December issue of IMPACT. Apparently few other IEEE Societies have a regular column on PACE activities in their newsletters.

Bob Fenton is to write a letter to Frank's employer commending him for his professional activities contributions.

IEEE FELLOWS AWARD PROGRAM

Bob Fenton noted that the Fellow awards program appears biased toward academia, with two few applications-oriented engineers being selected from the candidates submitted for consideration.

PLANNING OBJECTIVES FOR 1986

Bob Fenton submitted the following list of objectives for the Board during 1986:
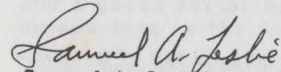
1. Integration of LTC into VTS.

2. Upgrading Vehicular Electronics area.

3. Increased membership.

4. Finalizing and implementing our awards program.

5. Completion of Constitution and Bylaws revision.

6. Development of advertising program.

7. Completion of Radio Propagation report and publication in VTS Transactions.

8. Returning the Transactions to "on time" status.

9. Strengthening of Chapter ties.

The next VTS Board meeting will be held in Washington, D.C. on March 13, 1986, at a location to be announced at a later date.

The meeting was concluded at 4:18 PM.

Respectfully submitted,

Samuel A. Leslie

Samuel A. Leslie
IEEE VTS Secretary

Professional Activities

Frank E. Lord
Professional Activities Editor

Is USAB Helping You?

Professional activities have been underway a dozen years now and we should expect to be able to see some results in our professional lives. Are you experiencing any measurable improvements?

At the National PACE (Professional Activities Committees for Engineers, the grass roots portion of the USAB organization) Conference last Labor Day weekend a challenge was made with respect to the effectiveness the United States Activities Board (USAB) and IEEE in solving the problems experienced by engineers in the course of their careers. It was in a session on the afternoon of second day entitled "Future Outlook for PACE/USAB" in a talk innocuously called "Future Expectations", that Bob Bruce, a PACE leader of long standing, unexpectedly made such a challenge.

He began by pointing out that the majority of IEEE members are practicing engineers and concluded that they are therefore the ones who should receive the most attention in the professional program. Among the problems of this group he cited the surplus in their numbers; organizations like AEA that flood the media with reports of shortages of engineers; alien engineers taking jobs at low salaries; subprofessional duties; lack of technical autonomy; and economic problems, such as salaries that lag behind inflation, lost pension benefits, and salary compression. Bob also noted the lack of dual-ladder career paths in most companies and the fact that engineers have to leave the practice of engineering to avoid salary stagnation and assure career permanence. From that, he drew up a list of what engineers need:

- More non-professional support; freedom from subprofessional responsibilities
- Less of a glut of entry engineers
- Quicker pension vesting or portable pensions
- More technical autonomy
- Salaries that don't lag behind inflation
- Elimination of the problem of alien engineers taking engineering jobs at low salaries
- Permanent elimination of wage-busting
- A channel through which engineers can really discredit bogus cries of engineering shortages
- A true dual-ladder system among numerous employers
- An IEEE that is truly supportive of engineers' goals
- Publications that are more like *Electronic Engineering Times*
- Reversal of salary compression

Bob continued with a list that he called "The Bad Side of the IEEE/USAB Track Record," which included:

- Bad guidance brochures
- Wrong legislative agenda
- Nothing substantive done about salaries
- Nothing done about colleges flooding the market with engineering graduates
- Head-in-the-sand attitude toward supply and demand of engineers
- Studying a problem to death; very slow to take action
- Inaction on alien engineering students entering the American job market at substandard salaries
- Publications, such as *The Institute*, publishing pap or articles demeaning to engineers
- Major boards ignoring the results of membership polls

He also presented a list of "The Good Side" and gave it equal time:

- Successful lobbying for pension reform
- Fighting against military restriction of unclassified information
- Prevented *The Institute* from becoming a "house organ," (although the issue is not yet closed)
- Backed change in DoD procurement regulations as a means of fighting wage-busting (a weak approach)
- Gives ample coverage to platforms of candidates for high IEEE office
- Exerts influence with White House Science Council
- Backed the right of engineers to hold public safety above employer interests
- Publicizes "professional practices for engineers and scientists"
- Issued good position papers on patents, intellectual property, and age discrimination

Bob addressed the composition of USAB, pointing out that most members are on other IEEE Boards. Thus, USAB is not "a board unto itself." He concluded that it could, therefore, be sandbagged by other boards.

He was also critical of the publication *The Institute* and listed articles that represented the majority of material published, which he considered to be of little or no interest to the practicing engineer:

- Supercomputer Research Said to be Near Fruition
- Students Urged to Apply for Bendix Awards

- FCC Approves Limited Use of Spread Spectrum
- IEEE Student Branch First to Travel to the Antarctic
- Engineering Directorate Reorganized at NSF
- IEEE Videoconference on Design Scheduled for May
- Spacelab Jet Wins Two NSPE Engineering Awards
- Optical Crossbar Switch to be Developed for Strategic Computers
- British Professor Conducts a Microprocessor Workshop for Indian College Students

He also supported Richard Tax's view on *The Institute's* poor handling of an article on obsolescence of engineers.

In contrast, he cited the type of articles that he believed practitioners are interested in. Bob characterized them as "live-wire and zingy," and they were all from *Electronic Engineering Times*:

- 29 Firms, Labs Quietly Swap Salary Data
- Taiwan Alarmed by Engineering Brain Drain
- Lockheed Ads Tell a Different Story (re: age discrimination)
- It's Sink or swim For AAES
- Engineering 101: As Told By Feerst
- EE Degrees in One Year—With a Catch
- Two Engineers Challenge Rockwell on Altered Pension Plan
- Pentagon Asks Contractors to Hold Down Salaries

He characterized the IEEE's *Federal Legislative Agenda* as largely for the benefit of colleges, mankind and corporations. You may judge for yourself by referring to the list of contents, which was cited:

- Computers and Communications
- International Trade and Technology Transfer
- Engineering Education
- Energy Policy
- Research and Development
- University-Industry Cooperation
- Space
- Department of Science and Technology
- Retirement Incom Benefits
- Service Contracts

After attacking our guidance brochures as poor and misleading, Bob continued with his "Predictions of Things to Come":

- Friction among PACE the Publications Board, and the Board of Directors over "freedom of the press" and control of *The Institute* will continue.
- CEU's and refresher courses will continue to be pushed as the principal cure of obsolescence.
- Skirmishes will continue between members who perceive that control is in the hands of major boards and the board members who try to keep it there and

strengthen their position.

- Competition between the USAB Manpower Committee and USAB will continue.
- Occasional outbursts from the Educational Activities Board, USAB and PACE will occur each time a new draft of a guidance brochure appears.
- Very gradual pension improvement will be seen.
- USAB committees and PACE will have to remain watchdogs over the IEEE and its professional affairs.
- Boom-and-bust cycles for engineers will continue, due to the four-year lag between college entry and career entry and also due to business cycles; colleges will continue to pump up registration after every bust.
- IEEE members who refute the "shortage shouters" will become better organized.
- Wage-busting will reappear during the next recession and then diminish.
- The dual-ladder system will be adopted by more employers. Fewer engineers will have to enter management for salary or survival.

Bob's final list addressed ways of improving USAB and PACE:

- Make the USAB VP a popularly elected position.
- Change the composition of USAB, so that it's not under the thumb of the other major boards.
- Get *The Institute* to publish less "gossip news" and more genuine coverage of issues that have an impact on the careers of engineers.
- Influence USAB not to "study a problem to death." Get it to take firm stand and push them through the Board of Directors.
- Respond to every questionnaire in *The Institute*.
- Become a corresponding member of the one USAB committee that pursues a goal you support.
- Participate in your Section or Society PACE.
- Get involved. Formulate a position. Pursue it.

In conclusion, Bob said, "The IEEE is a vehicle by which your career might be bettered. Do you have any other way? I doubt that you do. Therefore, this is the place." Needless to say, Bob Bruce's presentation generated considerable reaction from the floor. There was some negative reaction about the tone of his delivery, but the substance was not disputed to any great extent. One member said that this was the first real PACE material he had heard at the Conference (Remember, it was mid-afternoon, Sunday, more than midway through the sessions.) Jack Andersen called for a poll of the audience on the substance of Bruce's presentation. Approximately 55 percent agreed, 35 percent were neutral and 10 percent disagreed.

What are your own reactions? Are you satisfied with the results produced by USAB? Let me know your opinions or contact the Vice President of Professional Activities directly. If you really want things to happen, you might consider Bob Bruce's suggestion, "Get involved".

Chapter News

To all Vehicular Technology Society Chapter Chairpersons:

Best Wishes for 1986. May all Chapters report News and have a Prosperous Year.

Along with sending to the IEEE Section Headquarters your Meeting Report, please, do not forget to send a copy of your Meeting Report, the L-31 Form, to the undersigned Chapter Activities News Editor. Also, please fill in the part on attendance, in order for your Chapter to receive proper credit.

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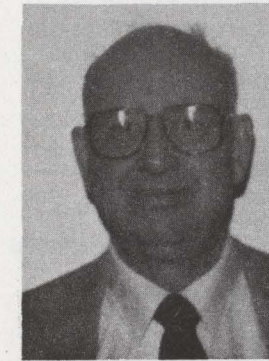
Bob McKnight
Transportation Systems Editor

April conference covers rail and transit equipment design, operations & maintenance

The 1986 American Society of Mechanical Engineers/Institute of Electrical & Electronics Engineers Joint Railroad Conference will be held April 9 and 10, 1986 at the Hotel Omni in Norfolk, Virginia.

Highlights of the two-day meeting will be the luncheon speakers: Walter W. Simpson, Vice President & Chief Engineer, Norfolk Southern Corp. will be speak on Wednesday, April 9, and Peter J. Detmold, General Manager, Advanced Train Control System Project, Association of American Railroads/ Railway Association of Canada joint sponsors will speak on Thursday, April 10.

The IEEE sponsoring group is the Vehicular Technology Society and its current Transportation Section (formerly the Land Transportation Committee).

Wednesday Morning Session, April 9 will be concerned with Transit Railcar and Maintenance Review.

London Underground's Tube Train will be discussed by D. Keith Ware, London Transport Docklands Light Railway.

Transit Shop Rehabilitation- An Overview will be the subject of a paper by Sam F. Fogleman, Stuart M. Robertson and Jerry E. McCleery of Morrison-Knudsen Engineers, Inc.

Rail Transit Energy Costs & Electric Utilities Power Rate Structure will be discussed by R. A. Uher and O. N. Sharma of Mellon Institute.

Miami-Baltimore Rapid Transit Railcar will be described by Ram Krisen, Mass Transit Association of Baltimore.

Locomotive-Railcar Trends will be discussed in four papers:

Trans-Rapid 006 Maglev Update by W. W. Dickhart, III of Transit America.

Power to the Seoul, Korea Trains by G. E. Griggs, Morrison-Knudsen Engineers.

A System Approach to Transportation Design by J. H. Parker of UTDC.

Mathematical Simulation of Locomotive Steady State Curving Performance Y Mostafa Rassaian and Karl R. Smith of Electro-Motive Division, GMC.

Power Control for Rail and Transit will be the subject of four papers on April 10.

Current Carrying Capacity of Overhead Contact System Conductors on AC and DC Electric Traction Systems by Dr. S. D. Jacimovic of EMJ/Electrack.

CAD Approach for Profile Optimization of Railway Wheel Tread by S. Suzuke, Y. Toya, H. Sakamoto, M. Nakata and M. Yamamoto of Sumitomo Metal Industries, Ltd.

Compensation Techniques to Increase Electrified Railroad Response by J. Burke of Power Technologies, Inc.

Equipment Operations and Track Maintenance will be the subject of four papers.

Influence of Empty/Loaded Devices on Braking of Lightweight Coal Cars While Loading on Steep Grades by Leonard A. McLean, Daniel H. Greer and David G. Blaine, Seaboard System.

The Design and Development of Steering Suspensions for British Rail by Dr.M. G. Pollard and G. A. Clayton, The Railway Technical Centre.

The Track Geometry Car, A Maintenance Planning Tool by Dr. Gunther Oberlechner of Plasser American Corp.

The Methodology Used by Hot Box Detectors to Identify Defective Bearings by J. E. Bambara of Servo Corp. of America.

Maglev & Linear Drive Conference in May '86

An International Conference featuring present and future technology of Magnetic Levitation and Linear Drive vehicles will be held May 14-16, 1986 in Vancouver, British Columbia, Canada.

The conference will be held in conjunction with Expo 86 and is sponsored by Transport Canada, Transportation Development Centre, by VTS/IEEE and by Canadian Institute of Guided Ground Transport at Queen's University.

The opening session will be held at the Ming Court Hotel jointly with the Fourth World Conference on Transport Research.

About 40 papers are planned for this Maglev and Linear Drives Conference.

For details write Drs. A. R. Eastham and G.E. Dawson, Department of Electrical Engineering, Queen's University, Kingston, Ont. K7L 3N6 Canada.

VTS '86 Dallas Conference to feature signal, operations & communications for railroads

The tentative program has been set for the Transportation Sessions at the 1986 Vehicular Technology Society meeting in Dallas, Texas, May 20-22 at Loew's Anatole Hotel.

Two sessions will be held- one on communications and one on signal & operations.

Communications topics include:

A Combined Carrier Squelch and Dual Tone Multi-Frequency (DTMF) Mobile PBX Access Terminal will be the subject of a paper by Frank Cooper, Jr., Electronic Engineer, Southern Pacific Transportation Co.

Integrated Voice/Data Mobile Radio for Railroad Applications will be discussed by M. J. Kent, Assistant Manager Communications Engineer, CN Rail.

Train Management- A Satellite Approach will be the subject of a paper by Thomas Trovato, System Engineer Communications and Signals, Guilford Transportation Industries.

Photovoltaic Power Systems- A User's Guide to Reliability in Sizing and Design

will be discussed by Thomas J. Ulrich, Vice President, Arthur N. Ulrich Co.

The signal and operations session will also feature four papers, as follows:

Freight Train of the Future: The Integral Train will be discussed by Thomas H. Engle, General Manager New Product Development, New York Air Brake Co.

Application of Microprocessors to Interlocking Logic will be the subject of a paper by Daniel R. Disk, Manager of Digital Logic of Union Switch & Signal Division of American Standard, Inc.

Southern Railway's Modernization of Wayside Signaling will be the topic of a paper by Forrest H. McIntyre, General Manager Signals & Electrical, Southern Railway System.

Yards 2000 will discuss the futre of railroad classification yards. The author is Charles W. Morse, Manager Systems Engineering, General Railway Signal Co.

News From Washington
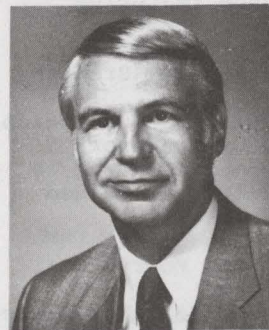
Eric Schimmel
Washington News Editor

Privacy - Social or Technical Issue?

An interesting problem has been raised by a pair of Congressional Bills which were introduced in the first session of the current Congress. HR-3378 and its identical twin from the Senate, S-1667, propose to amend portions of the US Criminal Code which deal with the interception and surveillance of communications. The bills which are entitled the "Electronic Communications Privacy Act of 1985," were sponsored in the interest of upgrading the privacy protection laws to keep pace with telecommunications technolgies. Existing law was written primarily for wired analog communications and is therefore considered to have a void regarding newer services such as electronic mail and cellular telephone.

The problem to which I referred is one of attempting to legislate a technically generated issue while largely ignoring the ramifications of that technology on the feasibility of enforcing the legislation. While it is commendable to attempt to protect one's rights against such intrusions as unauthorized wiretaps, it can be argued that technology in some cases does not provide the necessary condition of "reasonable expectation of privacy." For example, the user of a cellular telephone must understand that the radio segment of his transmission has no greater expectation of privacy than other mobile radio systems. To legislate that he does, perpitrates a falsehood. If curing social inequities were that simple, surely we would have legislated hunger and illness out of existence long ago.

Advanced Train Control Systems Project will soon reach spec writing stage

A February 5, 1986 public meeting of the joint project on Advanced Train Control System of the Association of American Railroads and the Railway Association of Canada was expected to bring the final system architecture to railroaders and suppliers.

Although not available when the issue of the VTS Newsletter wen to press, the ATCS Project meeting in Atlanta, Georgia was to include the following presentations:
-- The reasons for developing the proposed system architecture.
-- The interactive process to be used in 1986 for developing rail industry preferences concerning technology, performance and interfacing of the first 22 major components.
-- Arrangement for progressing the project and for component testing.

The Communications Act recognizes this. It's language has withstood efforts to make interception alone a violation, and continues to stipulate that an individual must disclose or use information which he has intercepted before a violation occurs. Also, similar legislation recently adopted by the State of California requires that such acts must be of a "malicious" nature to constitute a violation.

When technically informed legislators such as Senator Goldwater are involved, more rational results can be expected. For example, the Communications Act was amended recently to take into account the public reception of satellite TV transmissions such as HBO. The Senate sponsored revision recognized the right of an individual to receive such transmission for his or her own personal use if the program was not encrypted.

Encryption was also referenced by Congress's Office of Technology Assessment in a recent report prepared for the sponsors of HR-3378. While the report has some reservations about the cost and use of encryption equipment, it conceeds that this is "the only technological countermeasure thought at this time to be generally effective." Yet the proposed legislation completely ignores encryption as a possible remedy.

You might be asking why this issue should concern you or me. The following scenarios may provide some answers:

1. You are a cellular telephone subscriber and place a call to the office of a business associate, Bob. Bob's office tells you that he is in his car which is equipped with a radio and that they will "patch" you in. Bob's company has a two-way radio system licensed in one of the private radio services and is authorized to interconnect with the telephone network. As governed under the Communications Act, it is not illegal to intercept the transmissions of that system. In fact, FCC regulations mandate that other parties sharing Bob's radio channel must monitor before transmitting so as to not cause

interference to an ongoing transmission. The question arising from this scenario is of course, what if any portion of your conversation with Bob is subject to the proposed legislation, and how would it be enforced.

2. You own an older TV set with continuous UHF tuning. In other words, you can tune to the cellular band with your TV set. While searching for a channel you intercept a cellular conversation and listen awhile. A friend who was also present thinks this is most interesting and later tells others about what you did. Word eventually gets to a strong-feeling individual who reports you to the FCC, FBI, ACLU, and the local sheriff. Your only comfort is that there are at least several million other citizens who have the same potentiality of being tagged criminals.

3. Your family is in the kitchen having dinner. You are tuning in some easy listening at the high end of the AM band when you come across a voice conversation. Your ten year old recognizes the voice as your neighbor's with whom you are not on very good terms. He seems to have an older cordless telephone which operates within the range of your AM radio. The next day your ten year old, who is on better terms with your neighbor's ten year old, spills the beans about overhearing the conversation. You have all but forgotten about the incident when you are served your subpoena. Here again there are millions of citizens who will become at risk if the proposed legislation in adopted.

Lastly, we are reproducing below the testimony which the IEEE has given to both Houses of Congress on these Bills. I personally feel it is presumptive of the IEEE committee to file public comments on your and my behalf without asking our opinions but that's another subject for another article. Should you be inclined to let me know how you feel about either of these issues, I would be delighted to hear from you.

Mr. Chairman, my name is Lynn W. Ellis, Chairman of the Committee on Communications and Information Policy of the Institute of Electrical and Electronics Engineers (IEEE). The IEEE is the world's largest engineering society, with nearly 260,000 members worldwide, 214,000 of whom live and work in the United States. Approximately 82% of our membership is employed in industry, 8% in academic institutions, and 10% in the various government laboratories and agencies. The IEEE Committee on Communications and Information Policy is vested with authority to develop the Institute's communications and information policy; and, once that policy is adopted by the Institute, our committee is one of the major mechanisms by which the policy is voiced in public.

We thank you for the opportunity to present our views on S. 1667, the "Electronic Communications Privacy Act of 1985." Our Committee endorses S. 1667

in principle. We support measures to protect against the unauthorized interception and access of communications in communications and computer systems. We support, in particular, the attempt of S. 1667 to extend the protections against the interception of voice transmission to virtually all electronic communications. The present hole in the Wiretap Law of not applying its protections to digital information will be filled.

Our comments address mainly the technical issues that arise from the the definitions and provisions of S. 1667. We especially wish to eliminate technologically restrictive language, which may limit the application of the provisions of the Act in the years to come, as has happened with the current Wiretap Law. We have no comment on the procedural requirements to be followed by law enforcement and the judiciary, to authorize the use of electronic surveillance techniques, such as wiretaps, pen registers, and tracking devices.

Our comments are divided into two parts. The first part identifies the issues that were raised when our Committee discussed S. 1667. The second part of these comments, which I will not discuss today, but will submit for the record, detail our proposed changes in wording of S. 1667, and the reasons for those changes.

Following are the issues I wish to address:
1. Definition of the term "Electronic Communication"
2. Definition of the word "Intercept"
3. Lack of a definition for the word "Access" and other terms in S. 1667
4. Exceptions with respect to electronic communications
5. The title of S. 1667

1. Definition of the Term "Electronic Communication"

The proposal of replacing the phrase "wire communication" and its definition, with the phrase "electronic communication" and a new definition, is a bold step in the right direction. The problem of trying to apply the outdated term "wire communication" to modern technology is eliminated.

However, in the proposed definition for "electronic communication:"
* The word "photoelectric" should be replaced by "photoelectronic"
* A problem arises because of the inclusion of radio transmissions, the interception of which are also covered by Section 705 (previously numbered Section 605) of the Communications Act of 1934. How will the jurisdiction of each act be delineated to avoid contradictory results?
* The phrase "any transmission" should be expanded to "any communication made in whole or part through the use of facilities for the transmission"
* The "expectation of privacy" language "where the person originating such communication exhibits an expectation that such communication is not subject to interception under circumstances justifying such expectation" should be added at the end of the definition.

2. Definition of the Word "Intercept"

We recommend that the definition of the word "intercept" be stricken, and that the "plain meaning" control, as in Section 705 of the Communications Act.

The proposed definition is circular, "intercept is the interception of..." and would seem to require that the plain meaning of the word "interception" will control.

If the word "intercept" is to have a definition, we recommend that:
* The word "interception" be replaced by "unauthorized acquisition"
* That the language "or other technological means of interception" be added to the end of the definition

3. Lack of Definition for the Word "Access" and Other Terms in S. 1667

S. 1667 does not have a definition for the word "Access." In the second part of these comments we have submitted a proposed definition for the word.

Other terms which need definitions are "Electronic Communication Systems," "Electronic Communication Services," "Provider of Electronic Communication Services," and "User of Electronic Communication Services."

4. Exceptions With Respect to Electronic Communications

In the proposed Section 2511(2)(g):

* The term "readily accessible" should be changed to "accessible."

* The term "walkie-talkie" should be deleted.

5. Title of S. 1667

We recommend that the title of S. 1667 be changed to the "Electronic Surveillance Act of 1985." The issue here is perceptions and semantics rather than technology.

The most widely quoted recent definition of privacy is probably Alan Westin's: "Privacy is the claim of individuals, groups or institutions to determine for themselves when, how, and to what extent information about themselves is communicated to others."

S. 1667 does not provide controls over "when, how, and to what extent information ... is communicated." Rather, it seeks to provide protections to the electronic communications systems so that when a communication is made, there will not be any unauthorized interception. S. 1667 attempts to control the communication systems, not the communications contained within the systems.

Mr. Chairman, thank you for your attention to our statement. I will be happy to address any questions that you or the Members may have.

Proposed Changes in Wording of S. 1667
and
Reasons For Changing

Sec. 101 FEDERAL PENALTIES FOR THE INTERCEPTION OF
ELECTRONIC COMMUNICATIONS

1. Definition of the Term "Electronic Communication"

The proposed definition is as follows:

"'electronic communication' means any transmission of signs, signals, writing, images, sounds, data or intelligence of any nature in whole or in part by a wire, radio, electromagnetic, or photoelectric system that affects interstate or foreign commerce."

a. "Photoelectronic System" Rather Than "Photoelectric System"

Recommended additional language:

"'electronic communication' means any transmission of signs, signals, writing, images, sounds, data or intelligence of any nature in whole or in part by a wire, radio, electromagnetic, or photoelectric photoelectronic system that affects interstate or foreign commerce." (Underscore indicates language to be added, strikeover indicates language to be deleted.)

In physics, the word "photoelectric" refers narrowly to the ejection of an electron from a solid by an incident photon. The word "photoelectronic" refers to the combining of the technologies of optics and electronics, which is the intention of the definition.

b. Inclusion of Radio Transmissions Within the Definition of "Electronic Communication"

Since the definition of the term "electronic communication" includes radio transmissions, the interception of which are also covered by Section 705 (previously numbered Section 605) of the Communications Act, how will the jurisdiction of each act be delineated to avoid contradictory results?

For example, the Communications Act requires that the intercepted radio communication be also divulged and published; Section 2511(1)(a) of the Wiretap Law as amended by this Act only requires that the electronic communication be intercepted.

c. Addition of Language from Current Wiretap Law Definition of "Wire Communication" (Sec. 2510 (1)

Recommended additional language:

"'electronic communication' means any communication made in whole or in part through the use of facilities for the transmission of signs, signals, writing, images, sounds, data or intelligence of any nature in

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whole or in part by a wire, radio, electromagnetic, or [photoelectric] [photoelectronic] system that affects interstate or foreign commerce." (underscore indicates language to be added, strikeover indicates language to be deleted.)

The additional language is more consistent with the current definition of wire communication; this means that judicial interpretations applied to the earlier definition may be more easily used as precedent for the new definition. The additional language, however, in no ways limits the more varied forms of communication that the new definition is intended to encompass.

Including the phrase "use of facilities" emphasizes that the protections are applying to the communications systems rather than the communications contained within the system, stressing the fact that the means of communication and not the content are being regulated. This helps to avoid potential conflicts between the 1st Amendment rights for free speech and trying to regulate (and possibly having to monitor) communications.

d. Addition of Language from Current Wiretap Law Definition of "Oral Communication" (Sec. 2510(2))

"'electronic communication' means any [communication made in whole or in part through the use of facilities for the] transmission of signs, signals, writing, images, sounds, data or intelligence of any nature [in whole or in part] by wire, radio, electromagnetic or [photoelectric] [photoelectronic] system that affects interstate or foreign commerce where the person originating such communication exhibits an expectation that such communication is not subject to interception under circumstances justifying such expectations." (Underscore indicates language to be added.)

The expectation of privacy language added at the end of the definition is consistent with the language currently employed in the definition of "oral communication" in Section 2510(2) and U.S. Supreme Court decisions on privacy issues. If it is to be excluded, it is critical that the legislative history provide some rationale as to why:

* The "reasonable expectation of privacy test" is not to be applied to "electronic communications," but is to be applied to "oral communications."

* "Electronic communications" are to have absolute protection, unless subject to one of the stipulated exceptions.

2. Definition of the Word "Intercept"

The proposed amendments to the current definition are as follows:

"'intercept' means the aural acquisition interception of the contents of any wire electronic or oral communication through the use of any electronic, mechanical, or other device." (Strikeover indicates language to be deleted, underscore indicates language to be added.)

Our recommendation is that the definition of the word "intercept" be deleted, and that the "plain meaning" control, as in Section 705 of the Communications Act. The proposed definition would seem to require that the "plain meaning" of the word "interception" will control.

If the word "intercept" is to have a definition, we would recommend that in the proposed definition the word "interception" be changed to "unauthorized acquisition," and that additional language be added to avoid limiting the interception to "through the use of any electronic, mechanical, or other device."

"'intercept means the interception unauthorized acquisition of the contents of any electronic or oral communication through the use of any electronic, mechanical, or other device or other technological means of interception." (Strikeover indicates language to be deleted, underscore indicates language to be added.)

3. Lack of Definitions for the Terms "Access," "Electronic Communication Systems," "Electronic Communication Services," "Provider of Electronic Communication Services," and "User of Electronic Communication Services"

S. 1667 does not contain any definitions for the above terms. At this time, we would like to propose the following definition for the word "access":

"'access' means to instruct, interact or communicate with, intercept, or otherwise make use of any resources of an electronic communication system."

4. Exceptions With Respect to Electronic Communications

a. Proposed Section 2511(2)(g)(i)

"(g) It shall not be unlawful under this chapter for any person--

(i) to intercept an electronic communication made through an electronic communication system designed so that such electronic communication is readily accessible to the public."

What does "readily accessible" mean? What would be the difference between "readily accessible" and "accessible"?

b. Proposed Section 2511(2)(g)(ii)(II)

"(g) It shall not be unlawful under this chapter for any person--

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(ii) to intercept any electronic communication which is transmitted--

(II) by walkie-talkie, or a police or fire communication system readily accessible to the public.

Same problem with "readily accessible" as described in "a." above. The term "walkie-talkie" is a layman's term, is technologically restrictive, is covered by the proposed Section 2512(2)(g)(i) ("an electronic communication made through an electronic communication system designed so that such electronic communication is readily accessible to the public"), and can be deleted.

SECTION 1. SHORT TITLE

5. Proposal to Change Title of Act from "Electronic Communications Privacy Act of 1985" to "Electronic Surveillance Act of 1985"

For the reasons given below, we recommend changing the title to "Electronic Surveillance Act of 1985."

The term "Electronic Surveillance" rather than "Electronic

Communications Privacy" is more representative of the issues addressed in the provisions of this Act and the Wiretap Law, which it amends.

* The major purpose of the provisions is to regulate the circumstances under which government agencies may conduct electronic surveillance upon electronic communications systems.

* Privacy is not the main thrust. The most widely quoted recent definition of privacy is probably Alan Westin's: "Privacy is the claim of individuals, groups or institutions to determine for themselves when, how, and to what extent information about them is communicated to others."

The provisions of this Act do not provide controls over "when, how, and to what extent information... is communicated." Rather, it seeks to provide protections to the electronic communications systems so that when a communication is made, there will not be any unauthorized interception. This Act attempts to control the communication systems, not the communications contained within the systems.

Note: an advantage of emphasizing the providing of protections to the electronic communications systems rather than the communications contained within the systems, is that it avoids potential conflicts between the 1st Amendment rights for free speech and trying to regulate (and possible having to monitor) communications.
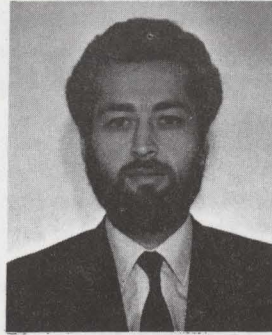
Communications

J. R. Cruz
Communications Editor

"A Field Test for Companded Single Sideband Modulation: Implications for Capacity Enhancement and Transmission Planning", E. Wallace, C. Adams, and D. Arnstein, Comsat Tech. Rev., Vol. 15, No. 1, Spring 1985.

Late in 1983, AT&T and the Deutsche Bundespost (DBP) of the Federal Republic of Germany conducted a field test of companded single sideband (CSSB) modulation in a test carrying live traffic between the U.S. and Germany over the INTELSAT system. This paper describes the planning, conduct, and results of that test as well as the implications for transmission planning and future capacity with the CSSB technique. A 12 channel-circuit group was tested between the AT&T switch in Pittsburgh, Pennsylvania, and the DBP switch in Frankfurt, Germany, via the Etam and Raisting satellite earth stations. A transponder bank that included existing FDM/FM carriers was chosen to match typical INTELSAT operating conditions, permitting the compatibility of FDM/FM and CSSB to be examined. Results of the objective performance tests are discussed, along with a description of the subjective testing methods used by AT&T and the DBP. Subjective testing rates CSSB as equal in quality to CFM and FDM/FM. Error rate measurements show its data-handling capability is adequate for 4,800-bits/s VF modem.

Results of voice level tests performed by AT&T at its New York switch are also introduced, and based on those measured values, this paper also provides a discussion of achievable transponder capacity and the variables affecting that capacity. Transmission planning for the field trial, which took into account existing traffic on other carriers, is also discussed.

"Performance of Nondiversity Receivers for Spread Spectrum in Indoor Wireless Communications," M. Kavehrad, AT&T Technical Journal, Vol 64, No. 6, July-August 1985.

In this work we have considered direct-sequence spread-spectrum transmission for indoor wireless communications. We have modeled the indoor communications medium, which is a multipath fading channel, by a discrete set of Rayleigh faded paths. We have proposed new analytical techniques to evaluate the probability of error for the receiver terminals studied in this work. Numerical results reveal that, for the nondiversity receivers considered here, Rayleigh fading is very hostile to this form

of modulation/multiple-access technique. The results also indicate that either some form of operation to prevent Rayleigh fading or diversity operation to counteract Rayleigh fading is required.

"Propagation at 500 MHz for Mobile Radio", B.R. Davis and R.E. Bogner, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

The basic characteristics of radio paths relevant to mobile radio communication at UHF are reviewed. Data gathered in a comprehensive survey of urban and suburban Melbourne were analysed to test for consistency with several simple models: Rayleigh envelope, a power spectrum model, log-normal distribution of mean, and the effects of distance and slope of terrain. Factors limiting the validity of some of the models are discussed. Other factors investigated were repeatability under varying weather conditions, the averaging required for reliable representation of local field strengths, and distributions associated with slow and fast fading patterns. A study of the applicability of space diversity showed that a saving of at least 75% of the transmitter power, for a given grade of service, could be made if diversity were used. Because of the number and complexity of the factors influencing the propagation to a vehicle, and because weather and time of day were not found to be significant influences, it was concluded that experimental assessment is a cost-effective method for determining accurately a service area. Examples of suitable data gathering plans are given.

Boundaries Between Radio Cells-Influence of Buildings and Vegetation," K. Loew, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

In mobile radio services, an efficient utilisation of the frequency spectrum can be achieved by the small-cell concept. However, small cells lead to high hand-over rates of the radio link between the mobile and the different base stations in the vicinity of the cell boundary. The absolute field-strength levels and the differences between them when received from various base stations are regarded as 'hand-over criteria'. In the UHF range, however, the field-strength level is subject to large variations, even in flat terrain, owing to varying usage. The

Deutsche Bundespost has performed mobile radio measurements at 450 MHz in an area situated to the south of Frankfurt, about half-way between two base stations. The land usage in this area is manifold; towns, forests and open fields are mixed. The field-strength levels were recorded along all main roads in this region, having a total length of about 100 km. The measurements and statistical evaluation of more than 10 million samples are described in detail. The influence of the mixed land usage and the hand-over criteria is discussed with the aid of a 3 km drive.

"UHF Wideband Statistical Model and Simulation of Mobile Radio Multipath Propagation Effects," A.S. Bajwa, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

A local wideband statistical model is presented for UHF mobile multipath propagation. The complex echo-envelope statistics have been derived from 10 MHz wideband pulse soundings at 436 MHz over a large area in suburban and urban localities. In the proposed model, the effects of Doppler-induced RF phase shifts have been considered. Echo paths are shown to fit a Poisson distribution for the excess time delays, while the echo envelopes conform to Rayleigh fading statistics. Correlated scattering, evident from echo path clusters in time-delay and echo-amplitude correlation coefficients in neighbouring path delay bins, is shown to be significant for excess path time delays less than 0.3µs. Disagreements observed for local and nonlocal scattering in different localities are discussed. The implementation of a wideband multipath simulator based on the statistical model is described. Digital computer simulation of DPSK is used as an illustrative example to demonstrate its usefulness.

"Prediction of Bit Error Rate in the Presence of Impulsive Noise: a Numerical Approach Using Measured Noise Data," J.D. Parsons and T. Reyhan, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

Predictions of bit error rate caused by a combination of impulsive and Gaussian noise are made for data communication systems using PSK, DPSK and FSK with direct carrier modulation. The technique uses the amplitude probability distribution (APD) to characterise the noise at the input of the receiver demodulator. A direct numerical approach (with numerical integration, where appropriate) is used to produce predictions for the case where decisions are made by sampling the demodulated signal at times nominally at the centre of the received data symbols, there being a minimum amount of postdetector filtering. Error rates in mobile data communication systems have been measured at roadside locations and in the laboratory. In the latter case, an impulsive noise simulator capable of producing noise

with specified statistical characteristics was used. Laboratory measurements have also been made with fading signals, and the prediction techniques have been extended to cover this case. Generally, agreement between theory and experiment is good, and it is concluded that the techniques are applicable in any system where channel separations are well defined and, consequently, where IF filters are adequately standardised.

"Bit Error Distribution in Digital Mobile Radio communication ¤ Comparison Between Field Measurements and Fading Simulation," R.W. Lorenz, H.-J. Gelbrich, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

It is proposed to test the performance of mobile radio equipment by use of a fading simulator. This procedure has the advantages that the measurements can be made in laboratories, and that the random fading is reproducible in its statistical character. It is essential, however, to compare the results of fading simulation with field measurements. The fading simulator used is non-frequency-selective, and produces the two main random processes, Rayleigh and log-normal superimposed. The mobile measurements were made near Darmstadt, F.R. Germany. In most cases the results corresponded well with the simulation. The expected dependences of the signal/noise ratio and speed of the mobile on the bit error rates (BERs) were confirmed. Some measurements, however, revealed higher BERs than expected. Moreover, losses of data synchronism occurred. These irregularities are caused by heavy obstructions of the direct radio path and extremely low obstructions of the waves scattered from mountains, which were so far away that the excess delay can be of the order of magnitude of the clock period of the digital signal.

"Digital Modems for Land Mobile Radio," A.P. Clark, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

The paper surveys the digital modulation methods available for use in land mobile radio systems. The modulation methods are compared on the basis of their relative tolerances to additive white Gaussian noise, and brief consideration is also given to the equipment complexities involved. The emphasis of the paper is on basic techniques and the essential mechanisms by which they operate, with a view to clarifying the factors that contribute to a good tolerance to noise. Prominence is given to constant-envelope signals, such as FSK, PSK and the various developments of these. Consideration is also given to the introduction of correlation or dependence between neighbouring signal elements, by means of partial-response or correlative-coding techniques, or else by means of convolutional codes, these being effective methods of

improving the tolerance to additive noise. Coherent, incoherent and noncoherent detectors are discussed, together with threshold-level and maximum-likelihood detection. However, the topics of carrier-phase and element-timing synchronisation are not considered here, nor are any details given of the detection processes. Finally, a selection is made of the techniques that are potentially the most cost-effective for land mobile radio systems.

"Coherent Demodulation of Pilot Tone Single Sideband With Phase-Locked TTIB/FFSR Processing," A.J. Bateman and J.P. McGeehan, IEEE Proc., Vol. 132, Part F, No. 5, August 1985.

The paper describes a simple modification to TTIB/FFSR signal processing which permits coherent demodulation of the received signal. This property is fundamental to the successful operation of some data modems used extensively in mobile radio. The operation of the modified processing is independent of the variable delay introduced by the transmitter and receiver RF/IF circuitry and by the propagation path.

"Experimental Evaluation of Packet Error Rates for the 850 MHz Mobile Channel," H.M. Hafez, A.U.H. Sheikh, and B. McPhail, IEEE Proc., Vol. 132, Part F, No. 5, August 1985.

A series of field measurements were conducted to examine the transmission characteristics of different digital land mobile systems in the VHF/UHF frequency bands. This paper briefly describes these measurements, and then focuses on the measured data that describe the bipolar coding/FM modulation with a bit rate of 4800 bit/s and an RF channel spacing of 25 kHz. The basic error characteristics of the channel are presented by (i) the average bit error rate, (ii) the gap length distribution and (iii) the error burst length distribution. The measured error pattern was used in conjunction with some known error control techniques, to examine their effectiveness in reducing the overall errors. In particular, the block coding techniques used in the AMPS system were evaluated and compared with other, simpler techniques having higher coding rates. The results are presented in the form of curves relating the packet error rate to the packet length.

"Adaptive Slow Frequency-Hopping System for Land Mobile Radio," I. Sabbagh and D.G. Appleby, IEEE Proc., Vol. 132, Part F, No. 5, August 1985.

The essential features of a novel adaptive slow frequency-hopping system are described. It is proposed that the system would operate in the heavily congested VHF private mobile radio bands by selecting currently inactive channels, hence increasing the overall spectral efficiency. A preliminary analysis of mutual interference is presented in full, the results of which indicate that a frequency-hopping system with a viable capacity could coexist with conventional private mobile radio networks.

"Relationship Between Base Station Transmitter Multicoupling Requirements and Frequency Planning Strategies for Cellular Mobile Radio," J.G. Gardiner and S.A. Kotsopoulos, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

Frequency assignment procedures in mobile radio systems generally aim at achieving a measure of intermodulation compatibility, and, in principle, provided sufficient numbers of channels are available and may be assigned with the minimum of restrictions, then this objective is achievable (at least as far as third-order products are concerned). However, in cellular systems, additional constraints are imposed by the need to multi-couple cell centre base station transmitters on to a common antenna, and this requirement sets a lower limit on the minimum frequency separation at cell centres, which, in turn, makes achievement of third-order compatible frequency plans extremely difficult. The paper examines the relationship between the minimum frequency separation for third-order compatibility and the number of available channels and cell cluster size, in order to identify optimum configurations.

"Experimental Vehicle Location System Using Decca Navigator and Dead-Reckoning Sensors," J.D. Last and C. Scholefield, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

An integrated vehicle location system is decribed which employs an automatic receiver of simple design for te Decca Navigator system, supplemented by an odometer and gymballed flux-gate compass. Data recorded on board the vehicle have been processed offline using a Kalman filter technique. Vehicle tracks are presented which show less than 70 m standard deviation of error over long routes in urban and rural areas.

"High-User-Density Digital Cellular Mobile Radio Systems," R. Steele and V.K. Prabhu, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

Digital cellular mobile radio systems are described having partially overlapping cells that are based on radio configurations, and in which the energy is radiated along the road from approximately street lamp elevations. One proposed system uses propagation frequencies in the vicinity of 900 MHz, employs adaptive differential pulse code modulation of 32 kbit/s and a minimum shift keying modem enabling a channel spacing of 25 kHz. One example of system performance shows that, for clusters of ten cells along a six-lane highway, the signal/interference ratio is 20 dB, the probability of error is 10^{-3}, and the channel SNR is 10.8 dB. Given an allocated mobile radio bandwidth of 20 MHz, the system can support 80 users per cell. If the vehicles are travelling at 88 km/h (55 miles/h) and 10% of the drivers make a telephone call, the cell length is 4.8 km (3 miles), and the cochannel distance is 48 km (30 miles). In our deliberations we made comparisons with conventional analogue FM systems, and showed that they have approximately half the user density capacity of the new system. A digital microcellular mobile radio system employing 60 GHz is also considered. The bit rate per segment of road was found to be vast, e.g. 100 Mbit/s per 100 m of road. This system is capable of providing portable communications to large numbers of pedestrians and drivers in congested city streets. Because of the configuration of the proposed cell structure, shadow fading is conjectured to have very little impact on system performance.

"Towards a High-Capacity Digital Cellular Mobile Radio System," R. Steele, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

A futuristic mobile communication system is proposed, based on the integration of a high-capacity digital cellular mobile radio system with a packet-switched routing network. Every communication terminal, e.g. a telephone, viewphone or computer, is coneected to the fixed part of the local area network (LAN) by short-distance radiocommunication. These terminals are deemed to be 'mobiles', irrespective of whether they are in motion. The propagation frequencies advocated are mainly those in the absorption band A_1 (51.4-66 GHz). Oxygen absorption of radiated energy in this band is 14 dB/km, and this characteristic is utilised to formulate microcellular structures that are tailored to suit specific geographical locations. The small size of the microcells ensures that the radiated power levels are low and that the data capacity per area is high, and, as a consequence, vast numbers of users can be accommodated. Although the microcells are shaped to the environment, the transceivers are standardised. All signals are digitised prior to radio transmission, and the fixed part of the LAN must be able to accommodate the huge mobile data rate, as must the main trunk network. Thus we suggest an optical-fibre LAN and packetised routing network to overlay the existing networks. Also considered briefly are noncommunication services, such as automatic vehicular location, integration of the communication network with an adaptive traffic control system, route guidance and the mobile office. The treatment is qualitative.

"Definition of a Cellular Mobile Radio System," C.J. Highes and M.S. Appleby, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

The regulatory and commercial framework for the introduction of a cellular radio system in the UK is unusual, in that it calls for two competing networks to interwork interchangeably with a range of mobile units. Connection to the fixed telephone network is also required. The Total Access Communication System (TACS) has been defined to meet such conditions. A description is given of the bases for the determination of the overall system parameters, particularly those concerned with the radio paths and end-to-end speech transmission. The definition of the key interfaces to permit interworking without restricting competitive technological development is also outlined.

"900 MHz Digital Cordless Telephone," P.D. White, M.K. Gurean, and R.J.G. MacNamee, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

The paper discusses several aspects of cordless telephony which are relevant to systems being discussed for use in the UK in the future. A variety of methods of arriving at traffic estimates are considered, including studies of population density in urban and suburban London. From these estimates it is shown that an allocation of at least forty channels will be needed to satisfy the demand of domestic and small business users. Three analogue and one digital modulation systems are considered, and it is shown that the digital system offers better use of the spectrum than the analogue systems. Additionally, the digital scheme allows convenient implementation of time-division duplex transmission, as well as ongoing call-quality monitoring. The paper looks at the merits of allocating one common channel for signalling purposes and compares these with the advantages of a simpler system, where the signalling information is carried on the speech channels. It is shown that significant extensions of battery life can be achieved by using a common signalling channel. Finally, the paper considers some of the implications of the time-division duplex system on receiver design.

"Problems of Mobile HF Communication and Techniques for Performance Improvement," M.Darnell, IEE Proc., Vol. 132, Part F, No. 5, August 1985.

The paper first outlines the inherent strengths and weaknesses of mobile and fixed terminals in HF communication systems. Conventional HF system design and operating procedures are then described. The improvement in performance achievable by the use of various forms of diversity combining is quantified, and it is shown how a number of fixed HF terminals can be combined into a

geographical diversity network, which can be accessed by mobile terminals. Specific problems of interconnection, data transmission and system control are considered in greater depth.

"Transient Nonstationary Behavior of a Delay Line Discriminator," F.W. Ratcliffe and D.R. Hummels, IEEE Trans. Aerospace Electron. Syst., Vol. AES-21, No. 5, September 1985.

The development of numerical methods for studying the transient nonstationary behavior of a delay line discriminator is presented. Expressions are developed for the mean and the variance of the output noise process. For the cases where the output is stationary, power density spectra are found.

"A Simple, Approximate Method of Generating Baseband-Serial MSR," J.O. Coleman, IEEE Trans. Comm., Vol. COM-33, No. 9, September 1985.

An alternate derivation of the serial formulation of the MSK signal leads to an approximate implementation that is based on filtering an easily generated three-level data signal through a high-Q, two-pole filter whose low-pass and bandpass outputs are modulated onto quadrature carriers.

"An Analysis of the Sensitivity of Digital Modulation Techniques to Frequency Selective Fading," K. Metzger and R. Valentin, IEEE Trans. Comm., Vol. COM-33, No. 9, September 1985.

This paper investigates the sensitivity to frequency-selective fading of different modulation techniques commonly used in digital radio systems. The modulation methods considered are phase-shift keying (M-ary PSK), nonoffset and offset quadrature amplitude modulation (M-ary QAM), and quadrature partial response signaling (QPRS). The performances of these methods during multipath fading are compared on the basis of the "signatures" calculated for idealized systems. Results are presented from which the relative outage probability was determined, assuming a propagation channel with frequency-selective Rician fading.

"On the Availability of Multilevel CPFSR Systems with Modulation Pulse Shaping During Multipath Propagation," O. Andrisano, G. Corazza, and G. Immovilli, IEEE Trans. Comm., Vol. COM-33, No. 9, September 1985.

The behavior of CPFSK systems with modulation pulse shaping and limiter-discriminator detection is tested in the presence of multipath fading.

With the aim of determing the eye-closure domain, a theoretical analysis is presented for a generic number of modulation levels. It is shown that, by suitably varying the maximum angular frequency deviaton ω_d, control of outage probability P_{out} is possible. Moreover, the choice of duty-cycle in the modulation pulse $\Delta\tau/T < 1$ leads to a lower value of P_{out} with respect to the conventional case $\tau/T = 1$, if we fix, as happens in practice, an upper bound in the transmitted power.

This promising characteristic deeply differentiates the CPFSK from the PSK, DCPSK, and QAM systems: CPFSK systems, with a fixed number of modulation levels, allow us to obtain decreasing values of P_{out} at the cost of increasing transmission power by suitably varying the set of signal parameters, even in the absence of diversity techniques and/or adaptive equalization.

"Digitally Phase Modulated (DPM) Signals," T.Maseng, IEEE Trans. Comm., Vol. COM-33, No. 9, September 1985.

Some properties of digitally phase modulated (DPM) signals are presented. Phase modulation with (overlapping) pulses generated by a digital FIR filter belong to this class, which may be considered to be a practical approximation to continuous phase modulated (CPM) signals. The power spectra of DPM signals are derived analytically. The ability of these signals to operate through an additive white Gaussian noise channel is assessed by calculating their minimum Euclidean distance. Their noise and spectral properties are found to be similar to those of CPM signals. Assuming that a Viterbi decoder is used to resolve symbol interference, the out-of-band power tends to decrease as the pulse duration increases, and the noise immunity is enhanced. At the same time the receiver complexity grows exponentially. hence, noise immunity and spectrum compactness are achieved at the cost of higher receiver complexity.

Modems for DPM signals are believed to be easier to implement than those for CPM signals. This is because filter design is simple and a residual carrier component can be retained to facilitate carrier regeneration. Furthermore, the accumulated carrier phase does not need to be continuously evaluated in order to perform matched filtering.

The analytic results derived are supported by measurements and simulations.

"Performance of Low Complexity Channel Coding and Diversity for Spread Spectrum in Indoors,Wireless Communication," M. Kavehrad and P.J. McLane, AT&T Technical Journal, Vol. 64, No. 8, October 1985.

The application of selection diversity in conjunction with simple channel coding is considered for a multiuser, slowly fading, Spread-Spectrum Multiple Access (SSMA),

digital radio system. For the most part, the index of performance of our study is the average bit error probability; we also give some consideration to multipath outage as a performance measure. All subscribers are assumed to communicate to a central station; that is, a star network architecture is assumed. Average power control is also assumed. The average mentioned in this context includes averaging over the channel fading statistics. The modulation is direct-sequence, spread-spectrum, binary phase-shift keying. We assume perfect timing and carrier recovery in our coherent receiver, and a slowly varying, Rayleigh fading, discrete multipath model is used. Previous analyses have found that SSMA can tolerate few simultaneous users for fading radio channels. We find that the combination of spread-spectrum modulation with low-complexity diversity and/or channel coding can restore fading-channel user levels to an acceptable figure. In addition, selection diversity plus channel coding is more effective than either method by itself. Finally, it turns out that SSMA is less sensitive to a change in the value of delay spread of a fading channel than, say, time-division multiple access. The method of moments is used to accurately assess the system error probability. Using this technique, we also assess the accuracy of assuming that the multiuser interference has a Gaussian distribution, which allows it to be analyzed by a simple method. Using this assumption, we compare selection diversity plus channel coding with the maximal-ratio-combining technique for diversity reception. Except for a high order of diversity, the former is more efficient and is always less complex than the latter.

"Baseband Cross-Polarizaton Interference Cancellation for M-Quadrature Amplitude-Modulated Signals Over Multipath Fading Radio Channels," M. Kavehrad, AT&T Technical Journal, Vol. 64, No. 8, October 1985.

In this paper we propose a novel baseband structure capable of adaptively mitigating cross-polarization interference in a dual-polarized, M-state quadrature amplitude-modulated received signal. We show that by using this canceler, performance signatures very close to single-polarized system signatures can be achieved for dually polarized digital radio systems.

"Cellular Mobile Packet Radio Using Multiple-Channel CSMA," N.D. Wilson and S.S. Rappaport, IEE Proc., Vol. 132, Part F, No. 6, October 1985.

One way to increase frequency spectrum utilisation in a mobile communication system is to divide the geographical region spatially into a number of cells, each of which contains a base station. Each base station is assigned a set of channels, and the users in the neighbourhood of a base

station can transmit their messages to the base station. Several protocols governing the access to the base station channels are available. The paper considers multichannel CSMA schemes embedded in a spatially cellular communication environment. Several alternative ways of organising the system resources, layout and protocol are considered. The complexity of the system is progressively increased, culminating in the general case: each base station is assigned a set of C_a channels and users access any one of the k nearest base stations with multichannel CSMA protocol. The performance characteristics of the system-normalised delay against system bandwidth utilisation-are given in terms of the system parameters. The several configurations considered are compared based on the delay, bandwidth utilisation and interference rejection characteristics.

"Efficiency of Outphasing RF Power-Amplifier Systems," F.H. Raab, IEEE Trans. Comm., Vol. COM-33, No. 10, October 1985.

The outphasing technique (LINC) combines two nonlinear RF power amplifiers into a linear RF power-amplifier (PA) system. The two PA's are driven with signals of different phases, and the phases are controlled so that the addition of the PA outputs produces a system output of the desired amplitude. However, the resultant time-varying impedances presented to the PA's alter their dc power comsumption and efficiency. Power and efficiency characteristics are derived for both simple (transformer-coupler) and Chireix (transmission-line-coupler with shunt reactance) outphasing systems using saturated class-B PA's. Simple outphasing systems have the efficiency characteristic of a linear class-B PA. Through proper selection of the shunt reactance, the efficiency of a Chireix outphasing system can be maximized at a specific output amplitude. The average efficiency with various amplitude-modulated signals is determined as a function of shunt reactance. Selecting the shunt reactance to fit the signal can improve efficiency by as much as a factor of 2.

"A Simple Method for MSK Modulation and Demodulation," S.M. Ryu and C.K. Un, IEEE Proc., Vol. 73, No. 11, November 1985.

In this letter, a simple method for modulation and demodulation of minimum shift keying (MSK) is proposed. It has a serial structure, and is easier to implement than the conventional parallel type. The MSK signal is generated by a digital synthesis method and the demodulation process is done by a simple sampling scheme.

"Performance of MRC Diversity Systems for the Detection of Signals with Nakagami Fading,"
E.K. Al-Hussaini and A.A.M. Al-Bassiouni, IEEE Trans. Comm., Vol. COM-33, No. 12, December 1985.

Bit error rate (BER) is analyzed theoretically for diversity reception in Nakagami fading environment using an M-branch maximal ratio combiner (MRC). Coherent and incoherent reception of frequency shift keying (FSK) are considered, using the multiple branch diversity system for both identical and different diversity branch fading parameters. The effect of correlation is also considered for the dual diversity case. The results are extended to include coherent phase shift keying (CPSK) and differential phase shift keying (DPSK).

"Low Complexity Carrier Phase Tracking Decoders for Continuous Phase Modulations,"
S.J. Simmons and P.J. McLane, IEEE Trans. Comm., Vol. COM-33, No. 12 December 1985.

Phase tracking capability is incorporated into two sequence estimation decoders for continuous phase modulations. One decoder employs the Viterbi algorithm; the other uses a reduced-survivor approach proposed earlier by one of the authors [11] for the more bandwidth efficient of these modulations.

Computational complexity with the simplest of the joint data/phase algorithms is only marginally greater than that required for the equivalent decoding algorithm employing an externally derived carrier phase reference as supplied by a conventional carrier recovery circuit. Simulations with representative partial response modulations demonstrate the phase synchronization and tracking capabilities of the decoders. High SNR losses relative to an optimal receiver having perfect phase knowledge are found to be small (~ 1 dB).

"Quadratue Vestigial Sideband (QVSB) Data Transmission,"
B.G. Henderson and J.A. Webb, IEEE Trans. Comm., Vol. COM-33, No. 12, December 1985.

The combined use of quadrature modulation and vestigial sideband filtering is investigated as a means of obtaining a spectrally efficient modulation scheme. The name quadrature vestigial sideband (QVSB) aptly describes the new system, whereby two independent data streams are each VSB modulated into the same passband, but on quadrature related carriers. The inherent interference between the quadrature related channels is shown to be of a controlled form, similar to the intersymbol interference (ISI) in partial response (PR) systems. Techniques suitable for "unwinding" the ISI in PR systems are shown to be also applicable to QVSB. Precoding with bit-by-bit decoding, nonoptimum and optimum probablistic decoding

are investigated. The latter method results in only a 1.2 dB E_b/N_0 degradation, at $P_b = 10^{-5}$, compared to coherent binary phase shift keying (BPSK), although up to a fourfold increase in spectral efficiency can be obtained.

"Effect of Adjacent Channel Interference and Frequency-Selective Fading on Outage of Digital Radio,"
I. Korn, IEE Proc., Vol. 132, Part F, No. 7, December 1985.

Digital radio is affected by frequency-selective fading (FSF), which causes intersymbol interference (ISI), and by adjacent channel interference (ACI), which in its turn is also affected by the same FSF. Using a two-ray model for the FSF, the transfer function of the channel is $H(f) = a[1-b \exp(-j2\pi\tau(f-f_0))]$. Outage in digital radio occurs when the bit error probability exceeds a critical value of 10^{-3}, or when an equivalent mean-square error exceeds a critical value σ_{ec}^2, which depends on the modulation used. In the paper we compute the critical mean-square error for M-QAM and M-PSK modulation where M = 4,8,16,64 is the number of symbols. In the absence of FSF, the system response for the signal in the main channel is a raised cosine with excess bandwidth β, and the receiver filter is matched to the transmitter filter. The signal in the adjacent channel has the same modulation as the signal in the main channel, although they differ in carrier frequency, amplitude, phase and symbol timing. We derive an expression for the mean-square error in the presence of FSF and ACI. The outage probability is a product of two terms one of which is independent of the modulation method, while the second is proportional to the area under a signature. The signature is a plot of the minimum value of $1-b_c$ as a function of f_0, where b_c is a critical value of b such that, if $b \geq b_c$, the critical mean-square error is exceeded. We compute the signatures and the area under the signatures for M-QAM and M-PSK (M = 4,8,16,64) with a bit rate of 140 Mbit/s and frequency separation between channels of 40 MHz. We conclude that, for low values of ACI, 4-QAM is the best system, while for large values of ACI, 64-QAM is the best system. 16-QAM is always better than 8-PSK.

"Performance of Generalised AMF receivers for Continous Phase Modulation,"
A. Svensson and C.-E. Sundberg, IEE Proc., Vol. 132, Part F, No. 7, December 1985.

Partial-response continuous phase modulation (CPM) signals can in many cases yield power spectra with narrow mainlobe and also low sidelobes. The optimum receiver for these signals is sometimes complex. In the paper the idea of using a smaller signal set in the receiver than used by the transmitter is considered. This is done by means of using a generalised average matched filter

(AMF) receiver. Only coherent detection of signals transmitted over an additive white Gaussian noise channel is considered. The multiple-symbol AMF receiver can be implemented with fewer filters than the optimum receiver. These receivers are analysed for various partial-response CPM signals. The analysis is done under the assumption of error-free filter and phase updating. A Euclidean distance for mismatched signal sets is used to give the symbol error probability for large signal/noise ratio conditioned on error-free updating. Under the above assumptions, it is shown that the multiple-symbol AMF receiver performs equally well as the optimum receiver for schemes with low modulation indices and also for large modulation indices for some schemes. This is the case both for binary and quaternary schemes. A simple updating method is also simulated.
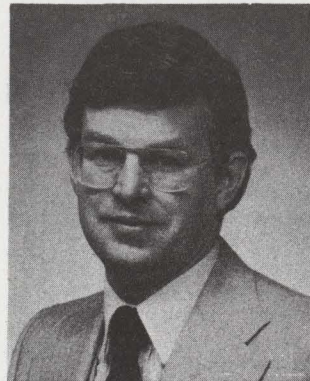
Vehicular Electronics

Bill Fleming
Vehicular Electronics Editor

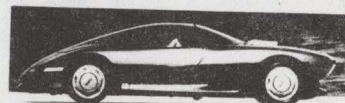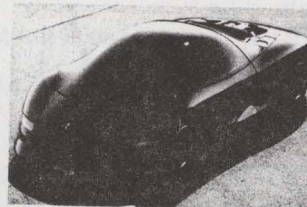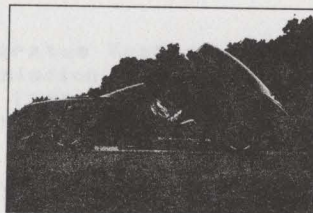### BUICK "WILDCAT" CONCEPT VEHICLE

A unique technological merging of driver and machine by GM's Buick Motor Division has produced a one-of-a-kind vehicle called Wildcat. Wildcat is a total integration of design, structure, electronics, powertrain, and driver/passenger considerations. A totally new 230 hp V6 engine with four valves per cylinder and dual overhead cam shafts was developed for use in this vehicle.

The Wildcat vehicle body consists of a sleek lightweight carbon-fiber shell with integrated frame, rather than a seperate chassis. Vehicle styling features exposure of the mechanical components of the engine. Exposure of engine components is a dramatic departure from standard vehicle design. The engine utilizes sequential-port fuel injection which is field-programmable to allow precise adjustments of the rate of fuel flow from inside the vehicle. This feature is intended for high-performance applications where drivers may wish to fine tune the performance of their engine to match road conditions. Engine oiling system uses a wet sump with remote oil filter and cooler. The electrical fuel pump is also remotely located.

Because the Wildcat engine developes 245 lb-ft torque, Buick felt it necessary to design in full-time four-wheel-drive. This provides substantially more traction and road handling than is possible with any two-wheel-drive system. In the Wildcat vehicle, a torque divider transmits two-thirds of the power to the rear wheels and one-third to the front wheels for best traction.

The transmission is a modified four-speed automatic with clutchless manual shift for precise gear control. Transmission electronics prevent down shifting at excessive engine speed and automatically return the transmission to first gear when the vehicle is stopped.

An aircraft-style "heads-up" speedometer, consisting of a transparent screen that reflects information from a dashboard display, allows drivers to keep their eyes on the road while monitoring speed. Other important readouts are mounted in a stationary hub within the steering wheel. The steering wheel hub displays engine speed, oil pressure, battery charge, fuel level, and coolant temperatures. In addition, a video CRT display provides a variety of readout information. One readout indicates front, rear, and side g forces experienced during vehicle maneuvers. Other displays show instantaneous horsepower and torque, a 3D map of the spark function for precise engine tuning, tire slippage at each wheel, tire pressure warnings, electronic compass navigation, and oil temperature [1-3].

Buick Wildcat Concept Vehicle
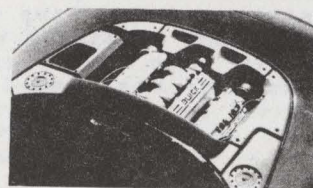
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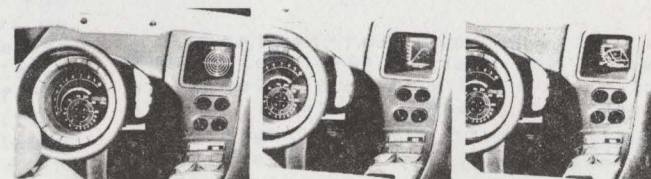
Wildcat Instrumentation Showing Various Displays Of Information

FORD OF EUROPE ELTEC CONCEPT VEHICLE

Ford of Europe Inc. has built a concept vehicle called Eltec, short for electronic technology. The vehicle includes an innovative research engine jam-packed with electronics that comfortably outclasses anything out yet on the market [4-6].

The Eltec vehicle utilizes an all-new lean-burn 1.3L 4-cyl. engine which slips under the future European emission-control category of 1.4L, eliminating need for an oxidation catalyst. The engine performance however comes very close to that of the 1.6L hemispherical engine currently offered in Ford's Escort. Fuel consumption of the 950-kg car in city driving is said to be 44 mpg, which is said to be attributal to the advanced engine-powertrain technology used in the vehicle.

Using only a portion of the capacity of Ford's EEC-IV microprocessor, engine management includes multipoint fuel injection; ignition and electronic drive-by-wire throttle control; adaptive feedback combustion control; variable inlet speed and swirl; variable tuned inlet runner lengths; and closed-loop emission control. There are three valves per cylinder -- one of the two inlet valves has a computer-controlled butterfly that remains closed at low engine rpm to provide high-low-end torque. In addition, the Eltec includes a unique variable inlet air flow system. Lengths of four inlet pipes are simultaneously varied accoring to load demand, using an arrangement of sliding sleeves inside a intermediate plenum chamber. The sliding sleeves are driven by a vacuum motor in accordance with computer command. The system allows engine breathing to be improved by ram-pipe effects, thereby improving bottom-end torque by resonant action to improve volumetric efficiency.

Adaptive feedback combustion control is made possible by use of a flame-front sensor located within the combustion chamber itself. The sensor measures increases in current due to arrival of flame front at its electrodes. Feedback signals from the sensors control air fuel ratios and ignition timing for each cylinder individually, permitting the Eltec engine to achieve lean-burn air fuel ratios as high as 20:1.

Management of the cooling system in the Eltec vehicle is also controlled by computer. At high speeds, vanes open up in the engine compartment to draw out surplus hot air. At the same time, the computer increases air flow through the radiator core. Water coolant flow is regulated via a heat sensor input signal. With this design the radiator has been made 30% smaller than that used on the equivalent Escort vehicle, and it can be fit into an aerodynamically placed air duct on the front bumper. The thermal management system reduces warm-up time of the engine thereby benefiting both fuel consumption and emissions.

The accelerator pedal is only one of several computer input signals in controlling the engine. The accelerator acts, through a potentiometer, to indicate the driver's power demand. The engine control computer not only determines the servo-operated throttle opening but also determines the gear ratio of the Ford CTX stepless transmission. The driver can select two different operating modes: "economy" and "power", wherein each mode corresponds to an appropriate program for optimized powertrain performance of the vehicle.

The Eltec suspension system utilizes electronically controlled air springs with automatic leveling and reduced ride height at high vehicle speeds. Suspension also is automatically stiffened during fast cornering, heavy braking, or lane changing. The Eltec vehicle features a venetian-blind-like sunroof with five glass louvers that can be electrically retracted for fully exposed roof. The sunroof assembly slides forward automatically when the ignition key is removed, though the slats remain tilted open to provide ventilation unless the driver shuts them. In case of rain, a humidity sensor switches on an electric motor to automically close the louvers.

Eltec Concept Vehicle

ON-DEMAND HYDROGEN FUEL GENERATOR IS VERY CONTROVERSIAL

In my previous newsletter, I reported a new and remarkable process by which hydrogen can be generated on-board a vehicle, according to demand, which was announced in the August 1985 issue of Automotive Engineering. In subsequent issues of this journal a great controversy regarding the credibility of this report has been aired by its readers [7-9].

Readers of the SAE Journal write that: This article lends the credibility of SAE to a ridiculous energy fraud. The maximum amount of hydrogen that can be produced by the oxidation of 1-kg of aluminum is 111 grams. Catalysts do not alter the mass of hydrogen production and electricity used in the circular fashion of the article is a hoax. The gasoline energy equivalent of 111 grams of hydrogen is about one-tenth of a gallon of gasoline. Even if this amount of hydrogen were produced, there would not be enough to move an automobile for several hours at highway speed as was claimed by the author.

Another reader wrote that in order to have a savings of 82% over gasoline, a hydrogen engine would have to be 90% more efficient and he doubts that this improvement is possible. Another reader wrote that if the process really does work, may the aluminum companies of the world rejoice -- and the oil companies wise-up. A professor from Carnegie-Mellon University wrote in that he estimated if aluminum were used to power the New York City Bus Fleet, six barge loads of aluminum hydroxide waste would be generated each day and would have to be somehow recycled. The supporting metallurgical and electric power complex for recycling would be huge.

Finally the originator of the on-board hydrogen generator wrote back in December [9] offering some technical defense for his work. He also mentioned that his group had received over 100 direct inquiries from reputable companies, institutions, and government bodies throughout the world. All inquiries expressed interest and many sought further information enabling them to make their own evaluations.

PONTIAC GOES MULTIPLEX IN '86

Packard Electric Division of General Motors says its steering wheel-mounted radio controls on the Pontiac 6000 STE for 1986 are the first domestic use of optical multiplexing on a U.S. car. This is also an example of the increasing agressiveness and entrepreneurial-mindedness of GM's supplier divisions [10].

A 12-switch package mounted on the steering wheel provides information to a Motorola 6805 microprocessor which is used to encode logic and scan the switch matrix to establish switch status. By means of time division multiplex format, the information is optically transmitted from the steering wheel to the steering column through an optical slip ring arrangement. Steering wheel mounted controls include: volume, tuning, fade, seek, scan, preset, recall, AM/FM, and mute.

Packard Electric estimates that about 40 thousand of the steering wheel mounted controls will be used during the 1986 model run. It was also estimated that optical multiplexing could be used on as many as one half million cars by the year 1995. To date, there has been considerable reluctance on the part of car makers to put other controls -- such as headlamps -- on the steering column because of safety considerations.
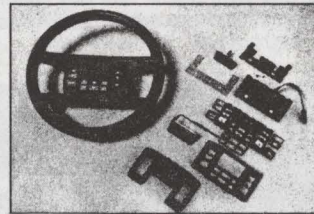
Wheel Mounted Optical Multiplexed Radio Controls

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International Conference on Maglev and Linear Drives

Site and Date

The International Conference on Maglev and Linear Drives will be held at the Ming Court Hotel, Vancouver, B.C., Canada, May 14-16, 1986. The Ming Court Hotel is located within walking distance of downtown Vancouver, Stanley Park, and the EXPO 86 site.

Technical Program

About 40 papers are planned for presentation, from England, Federal Republic of Germany, France, Japan, United States, and Canada. The technical sessions will be held at the Ming Court Hotel, on May 14 and 15.

Fourth World Conference on Transport Research (WCTR)

The opening morning session of Maglev & Linear Drives '86, on May 14, will be held at the Ming Court Hotel jointly with the Fourth World Conference on Transport Research. This session is intended to give an overview of world-wide activity in Maglev and Linear Drives, and will provide the opportunity to inform interested delegates to WCTR of developments and the potential of these technologies.

EXPO 86

EXPO 86 — World in Motion, World in Touch — presents a salute to past achievements, a celebration of present progress, and a sign-post to the future of transportation and communications. Maglev & Linear Drives '86 is an EXPO 86 Specialized Periods Endorsed Event, and will serve as a showcase to display Maglev technology.

Accommodation

Vancouver will be very busy in 1986. A block of rooms has been reserved at the Ming Court Hotel for three nights (arriving May 13, leaving May 16). It is important that we have accommodation reservations early. Please complete and return the enclosed registration form by March 15, 1986. Every effort will be made to find accommodation for late registrants.

Vancouver

Vancouver, with a population of 1.5 million, is Canada's third largest city. It is a cosmopolitan city situated on a magnificent natural harbour, above which the coastal mountains rise abruptly. It is well known for its excellent international restaurants and miles of safe sandy beaches. In 1984, the Port of Vancouver handled nearly 60 million tons of cargo, making it among the world's top ten ports in terms of export tonnage.

Springtime is a beautiful mild season in Vancouver. Average daily temepratures range from 8C (46F) to 17C (63F).

Travel

Vancouver is served by many international and North American airlines, and by transcontinental train service. CP Air and Air Canada have been appointed dual "Official Carriers" to the conference (please see back panel). *Early reservations are recommended* — flights to and from Vancouver are likely to be booked up early with EXPO 86 visitors.

Registration

Registration forms are enclosed. Please complete and return early as possible. For further information, contact:
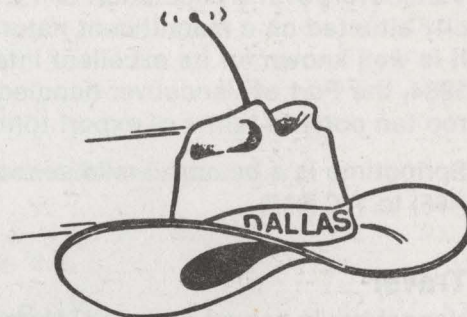
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