

Summary Report by WSDOT / TRAC

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# **68th Annual TRB Meeting**

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**Washington State Department of Transportation**  
Washington State Transportation Center

## **Forward**

The following document is a compilation of trip reports provided by WSDOT/TRAC to the 68th Annual TRB Meeting.

The attendees' descriptions or notes for each TRB session and a follow-up name for future action is provided so that the Department can maximize the benefits of sending representatives to this annual meeting.

The sessions have been categorized into functional areas so that specific subjects can easily be found.

**Disclaimer**

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Washington State Transportation Commission, Department of Transportation, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

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**BRIDGE**

Attendee	Session Title	Comments	Follow-up Name	Comments
Babaei, Khossrow	Bridge management system  Bridge management system workshop	Three important developments in bridge management system (BMS) were reported.  NCHRP Report 300 documents a model BMS at the network level. The model BMS can be customized according to the transportation agency's needs. A computer program, suitable for microcomputer, has been written in conjunction with the model BMS, which has storage for 5,000 bridges. The coding of the program will be finished by summer of 1989.  FHWA has developed a model BMS to estimate future conditions of bridges at the network level. The model is used by FHWA to report to Congress about budget needs for national bridge management. The model BMS will be available to states by the end of 1989. A mainframe computer is needed for the model, but later a microcomputer can be employed. A BMS has been developed by Cowi-Consult, an engineering firm from Denmark, for Thailand. The BMS is microcomputer based and has capacity for 10,000 bridges. The BMS operates at both the project level and network level. Deterioration rates for each element are found individually based on inspection reports. Performance curves for each element are established to forecast future conditions, reconstructions, and the associated costs. Manuals for the BMS have been prepared.	Henley, Ed Whitney, Willis	
Babaei, Khossrow	Committee on concrete bridges:  Concrete bridges	Research needs and issues were discussed. Among those issues were standardizing the design of shear reinforcement in continuous prestressed girder bridges; reevaluation of the strength of bridge decks to reduce deck reinforcement; evaluation of the practicality of high strength concrete with respect to accommodation of prestressing tendons; and evaluation of the potential problems with differential temperatures (in and out temperatures) in massive concrete during hydration.	Henley, Ed Lwin, Myint	
Babaei, Khossrow	Session 8: Strategic Highway Research Program  Performance history of field cathodic protection in the United States and Canada  (Jack Snyder, Battelle Columbus Division)	Presented a progress of SHRP's cathodic protection research. A questionnaire has been sent to highway agencies and results have been tabulated. The questionnaire involves types of bridges with cathodic protection, climate, bridge condition prior to cathodic protection installation, bridge component protected, type of cathodic protection installation, and cathodic protection design criteria.	Henley, Ed	

Attendee	Session Title	Comments	Follow-up Name	Comments
Babaei, Khossrow	Session 29: Design and construction specifications for segmental concrete bridges  Segmental concrete bridges	The first US specifications on methods of design for segmental concrete bridges has been prepared by Post Tensioning Institute under NCHRP research project 20-32. The session presented views of designers and contractors regarding the specifications. Longitudinal analysis, transverse analysis, and erection analysis are included. A strut-and-tie model is presented to analyze end anchorage and diaphragm regions. Thermal effects are taken into consideration. The long-term effects of creep are considered insignificant, thus there is no change from present code. The effects of various types of joints on the stiffness of the structure are given.	Henley, Ed Lwin, Myint	
Babaei, Khossrow	Session 69: Corrosion of steel in concrete  Correlation between corrosion of reinforcing steel and voids and cracks in concrete structures (R. Heidersbach, California Polytechnic Institute)	The speaker presented his personal opinion based on his experience that concrete cracking is the sole cause of corrosion of the embedding reinforcing steel and that reinforcement in concrete without cracks should not corrode. This opinion was rejected by many since the vast field and laboratory experience clearly indicates that the embedded reinforcing steel can corrode depending on the severity of the salt environment and depth of cover in the absence of cracking.	Henley, Ed Anderson, Keith	
Babaei, Khossrow	Session 69: Corrosion of steel in concrete  Deicing salt corrosion with and without inhibitors (M. Callahan, Iowa DOT)	Described the results of an experiment to determine the effectiveness of adding corrosion inhibitors to deicing materials in preventing corrosion of reinforcing steel. Four different deicers and combinations were tested. These were quick salt plus PCI, Cargill CG-90, CMA plus sodium chloride, and CMA. Only the latter proved to be effective.	Henley, Ed Anderson, Keith	

Attendee	Session Title	Comments	Follow-up Name	Comments
Babaei, Khossrow	Session 69: Corrosion of steel in concrete	Described a practical method of measuring the rate of corrosion of steel in concrete using linear polarization. Because of the variability of the test results, the results are only used to predict the time-to-deterioration of the concrete rather than loss of structural steel.	Henley, Ed Anderson, Keith	
	Measuring rate of corrosion of steel in field concrete structures (C. Clear, Kenneth C. Clear, Inc.)	TRAC is currently involved in a research project for FHWA to modify the rate of corrosion measuring test for field applications.		
Babaei, Khossrow	Session 69: Corrosion of steel in concrete	Described the collapse of a segmental concrete bridge in the UK. The bridge failed in the longitudinal direction because of the corrosion of the longitudinal prestressing tendons in a transverse joint. The failure was sudden, and it occurred in the early morning when the temperature was low. Corrosion had also occurred in the transverse prestressing tendons at the longitudinal joints.	Lwin, Myint Henley, Ed	
	The collapse of a segmental post-tensioned concrete bridge (R.J. Woodward, U.K. transport and road research laboratory)			
Babaei, Khossrow	Session 69: Corrosion of steel in concrete	After 10 years of experience with embedded reference cells, it appears that solid graphite electrodes are the most durable and reliable. Silver-silver chloride electrodes also seem to be durable, but they may be influenced by the chloride content of concrete.	Henley, Ed Anderson, Keith	
	Reference cells for embedment in cathodically protected concrete (D.G. Manning, Ontario Ministry of Transportation)			

Attendee	Session Title	Comments	Follow-up Name	Comments
Babaei, Khossrow	Session 131 and Task Force on structural applications of fiber reinforced plastics  New structural applications of fiber reinforced plastics	Fiber reinforced plastics (FRP) are being used for the construction of bridges and buildings internationally where steel, because of its corrosion, weight, and magnetic characteristics, cannot be used. Concrete prestressing tendons, reinforcing bars, cables, and flexural load bearing systems, such as girders and modular bridge deck systems, have been developed and used. Research in this area is certainly warranted before FRP is used widely.	Henley, Ed	
Babaei, Khossrow	Session 172: Advancements in bridge joint seals and bearings  Low temperature behavior of elastomeric bearings (C.W. Roeder, University of Washington)	Described the findings of NCHRP report 298. Of importance in the design of elastomeric bridge bearings is the amount of load transferred to the substructure as a result of the stiffness of the elastomer. The stiffness of an elastomer can increase in time when the material ages in cold temperatures (crystallization). Depending on the nature of the elastomer and duration of the cold temperatures, the stiffness of the bearing can be large enough to cause a significant amount of unexpected loads in the substructure.	Lwin, Myint Henley, Ed	
Gloyd, C..S.	Session 75-B: Bridge Construction and Maintenance	Structural engineers are not involved regularly during the construction phase of bridge projects, according to a national survey of states. They should be available and used for many tasks during construction as part of quality assurance effort. The new ASCE Manual on Quality of Construction is cited as an excellent reference.  North Carolina has had success in holding annual bridge workshops where engineers from design, construction, and maintenance get together to exchange suggestions for better quality.  Traditionally, toll bridges are better maintained than toll-free bridges because of funding availability and bond holder requirements. The design-construct method of bridge building leads to inferior quality because of emphasis on low initial cost. Integrated shop drawings are now recommended for complex concrete bridges.	Markich, George George, Bob	

Attendee	Session Title	Comments	Follow-up Name	Comments
Gloyd, C.S.	Bridge Management Workshop	<p>According to Congressman James Oberstar from Minnesota, Congress continues to be concerned with bridge safety and looks to FHWA to insist that states and local agencies further improve their bridge inspection practices and corrective actions. Development of comprehensive bridge management system procedures and computer software is continuing through NCHRP and FHWA projects. Several states have contracted with local universities for assistance. Most states now are making some kind of effort to adopt the bridge management concept. Some advocates are planning on even larger "highway management systems" or "transportation management systems" that integrate bridges, pavements, appurtenances, etc., into more grandiose programs.</p> <p>A small PC-based program written for local agency use should finally be available shortly. This was developed in Kansas using a system designed in North Carolina.</p>	George, Bob Henley, Ed Moon, Stan	
Gloyd, C.S.	Committee A2C01: General Structures	<p>Current practices in timber bridge design and construction were presented by Clyde Weller of the USFS. He is a possible speaker for the Western Bridge Engineers Seminar in Coeur d'Alene, Idaho, in October 1989. In some areas, timber is again competitive with concrete for bridge construction.</p> <p>A bridge inspection firm showed how it uses rock climbing techniques for bridge safety inspection work. It is safe and cost effective on major structures.</p> <p>TRB may publish the committee's report on bridge aesthetics, but it needs a sponsor to defray the high cost of color printing. Maryland plans to design a competition procedure for a new bridge near Annapolis.</p>	Henley, Ed Whitney, Willis Mays, Ralph	
Gloyd, C.S.	Session 172: Bridge Joints and Bearings	<p>A new NCHRP Synthesis on bridge joint evaluations will be published in 1989. The general finding is that joint products are still not reliable. Part of the problem is underestimation of joint movement and use of too small a joint system.</p> <p>Lehigh University structural lab has tested bridge bearings for many years. Large pot and spherical bearings are difficult to fabricate and test. Each bearing is because of fabrication variables. A combination of vertical and horizontal loads with rotation is a severe test condition. Bearings can be worn out by overtesting.</p> <p>A survey of pot bearing performance shows that experience has been generally satisfactory except in Washington state.</p>	Markich, George	

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Gloyd, C.S.	Session 149: Underwater Inspection of Bridges	A preview of the FHWA Demonstration Project 80 on underwater inspection of bridges shows that it will be an excellent opportunity for practical training and will provide good information on the various equipment and techniques. WSDOT has already requested this demo. Local agencies and private firms can be included. A completely equipped boat and trailer for this type of inspection will cost \$120,000 to \$160,000.	George, Bob Whitney, Willis Henley, Ed	
Gloyd, C.S.	Session 101: Steel Bridges	Several bridges of very slender steel (intentionally out of specification) built several years ago have been carefully evaluated. No harmful effects are evident. Excessive cracking of the deck slab has been expected by some engineers, but these case studies show no such problem. A change to the AASHTO design specifications is recommended.  The performance of existing steel beam bridges can be improved by increasing transverse stiffness and post-tensioning, as well as by adding material to beam flanges.	Markich, George George, Bob	
Gloyd, C.S.	Session 49: New AASHTO Bridge Code	This 42-month NCHRP project is 6 months in progress. The various task groups to write the provisions have been selected and the initial draft is in outline form. Features of the new code, which will use reliability based load and resistance factor concepts, are being fully explained and communicated to bridge engineers throughout the country. The benefits of this new bridge design specification include uniform reliability — avoiding excess cost, but assuring structural safety; more professional coverage of all aspects of design using recent research and testing; attention to maintenance and constructability concerns, as well as load capacity; and improved compatibility with computer technology. The best qualified expertise is being obtained for this work, including outside professionals, as well as government staff engineers. (Gloyd serves on the NCHRP Panel.)	None at present.	
Gloyd, C.S.	Session 29: Segmental Concrete Bridges	The new AASHTO Guide Specification for Concrete Segmental Bridge Design is now complete and will be available for use soon. It covers issues and problem areas learned from past experience. Special criteria have been adopted regarding the sensitive construction conditions involved with this type of construction. One major new design procedure, the "strut and tie" method, is introduced for shear design procedure and discontinuity areas. Special construction requirements are also covered, including attention to constructability items. (Markich served on the project work group.)	Markich, George Ruth, Chuck	

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Attendee	Session Title	Comments	Follow-up Name	Comments
Gloyd, C.S.	Committee A2C03: Concrete Bridges	A complete list of known computer programs for concrete bridge analysis has been prepared by a subcommittee. A third TRB Bridge Conference is being planned for 1991. Previous conferences have been held in 1978 and 1984. The "strut and tie" method for the design of certain portions of concrete bridges was explained by Professor John Breen. This should be added to our design office practice.	Markich, George Nelson, C. Ernest Henley, Ed	

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Attendee	Session Title	Comments	Follow-up Name	Comments
Henley, Ed	Bridge Management (11 speakers) BMS Workshop	<p data-bbox="755 326 1763 492">Congressman James Oberstar (Chairman, House Subcommittee on Public Works), acknowledging the short-fall of the current budget of \$1.6 billion in addressing the \$51 billion needs (FHWA later noted the "new" backlog figure being sent to Congress is \$67 billion), indicated a need for more active oversight by FHWA of state programs and need/concern for "wiser use" use of available funds by states. The message was that states need to do their share, that the feds cannot do it alone.</p> <p data-bbox="755 521 1763 662">He emphasized the recent study by his subcommittee on underwater inspections (prompted by the serious concern by Congress for bridge failures). Only 17 states are in compliance with the inspection guidelines and 22 more could be within 2-4 years. Elements of concern by the subcommittee were not restricted to flood areas; earthquake areas, salt air deterioration, ice float areas, potential ship collision areas, and fracture critical members were noted.</p> <p data-bbox="755 691 1763 803">He noted that the biggest surprise during the subcommittee hearings was the testimony regarding the low number of engineers being graduated and relatively few ending in bridge related engineering. He emphasized pay differences between private and public and the marked difference between Japan and the United States. We turn out more lawyers than engineers.</p> <p data-bbox="755 833 1763 922">He expressed strong concern for the present caveat of allowing states to inspect "some" bridges at frequencies greater than two years. He suggested that this would result in greater risk while only saving \$8.4 million per year.</p> <p data-bbox="755 951 1763 1036">Continue current emphasis on a practical level of underwater and fracture critical inspection. Base inspection manpower needs projections on the assumption that relaxation by FHWA of the current frequency of bridge inspections is not likely to be significant or permanent.</p> <p data-bbox="755 1065 1763 1230">Congressman Oberstar sounds a clear message that needs are growing much faster than the Trust Fund and that Congress and the feds will be looking increasingly to states, cities, and counties to do more to deal with the \$67 billion (and growing) backlog. It is not new news . . . one could take it as a message that those who do not provide for a better tax base locally now will be standing in a very long line if they await the feds to solve the problems. It is for sure that just "wiser use" of funds is not going to reduce the needs growth, let alone the backlog.</p>	George, O.R. Whitney, W.A.	

Attendee	Session Title	Comments	Follow-up Name	Comments
Henley, Ed	Bridge Management Systems BMS Workshop (Frank Carmichael, A.R.E. Inc.)	Report on NCHRP 12-28(2) (Report 300) findings. Objective is development of a microcomputer-based working network level BMS with six component modules.  Working module expected by mid-1989 (will need validation with sizable real data base).		Additional funding (apparently not presently planned by TRB) will be needed if the envisioned BMS is to be carried to fruition. We will continue to track the project and possibly test the working module when it becomes available if it shows applicability to our BMS needs.
Henley, Ed	Session 69: Corrosion of Steel in Concrete	A paper based on research at California Polytechnic State University concluded that cracking induced in concrete by corrosion of reinforcing steel is "always" precipitated by cracking, i.e., "cracks cause corrosion, it's never vice versa." This is contrary to our commonly held beliefs based in part on a substantial volume of related other research.		The philosophy of protecting reinforced concrete from reaching 1.2 to 2.0 pounds per cubic yard of chloride contamination without considering the nature and extent of cracking may warrant further research, possibly through TRAC.
Henley, Ed	Session 149: FHWA Demonstration Project: Underwater Bridge Inspection Training Workshop	This training combines classroom instruction with a field trip demonstrating ground penetrating radar, black and white fathometer, color monitor fathometer, and tuned transducer aboard FHWA's \$140,000 300 h.p. inspection boat (limit 10 students for field trip, 20 for class).		Request for class before May or after September 1989 for WSDOT and local agencies was submitted to FHWA since January 1989 TRB meeting.

Attendee	Session Title	Comments	Follow-up Name	Comments
Kilian, Al	Committee A2K03: Foundations of Bridges and Other Structures	<ol style="list-style-type: none"><li>a. Committee continues to see a need to sponsor a special session on contracting practices for foundation construction. The emphasis is to be on how to maximize innovative cost saving construction technology in the public sector. Al Kilian was appointed to the four-person subcommittee to develop the program.</li><li>b. George Goble presented some new information on allowable driving stresses in timber piles (use 3,000 psi).</li><li>c. There was a discussion on revision to AASHTO Bridge Specification Foundation Sections. The specification is being expanded and is in the early draft stage at this point.</li><li>d. Jean-Louis Briaud made a presentation on bitumen coated piles. Possible reduction in costs due to downdrag loads up to 2/3.</li></ol>	Materials Lab Geotechnical Section	

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 29: Design and Construction Specifications for Segmental Concrete Bridges	<p>Cliff Freyermuth — Design considerations, bidding, specifications (materials), testing, construction provisions. To be published in April.</p> <p>John Breen — learned by 20 years of problems and mistakes with epoxy, all types of joints transmit shear OK. Creep and shrinkage and thermal loads <u>very</u> important. Limit state values not based on much research, but lots of experience. It <u>is</u> conservative; especially when combined with provision for extra tendons.</p> <p>David Goodyear — Much discussion on strut and tie method. Some on thermal gradient and temperature response. Says creep and shrink not well covered--need a good, rational design method.</p> <p>Umesh Vasishth — Reviewed several WSDOT designs. Says we've learned to work more closely with contractors and field people. Have had some claims — Denny Creek and Lake Washington. Did not use strut and tie method for 504 bridges, but don't disagree. Believe allowance for tension under construction loads needs to be more conservative. We're more conservative in strength reduction factors (partly due to seismic). We prefer complete designs and plans.</p> <p>Al Harwood — Some examples of common problems on construction. Thinks new guide will eliminate about 95% of these. In Q and A, Cliff says a lot of past problems are in "construction, administration" . . . Some of this may not be helped by new guide, i.e., time for approvals. American Segmental Bridge Society (recently formed) says should help (includes contractors). Harwood says design specifications should be in construction documents. Cliff says there's too much adversarial relationships. Q. from representative from T.Y. Lom about claims . . . will this reduce or eliminate? Umesh says it will help.</p>	Vandehey, Del Slemmer, Clyde Gloyd, Stew (in attendance)	

**DESIGN**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Session 218: Pile Capacity — Geotechnical Engineering	Richard J. Fragaszy of WSU presented the results of our WSDOT sponsored research on pile capacity. The research looked at various pile driving formulas to determine which gave the best prediction of ultimate pile capacity as determined by load tests on 63 piles. The Gates Formula was determined to be the best predictor and the ENR one of the worst. WSDOT is considering replacing the use of ENR with the Gates Formula.	Kilian, Al	
Gloyd, C.S.	Session 73-A: Contract Documents for Bridge Construction	<p>A bridge contractor states use of unilateral change orders is very poor practice because it avoids the issue and delays settlement. Traffic staging in rehabilitation projects has become a major contract item. Specifications that reference rather than cite important regulations are ineffective.</p> <p>Alternative designs for bridge projects add confusion to the bidding and create poor contracts, according to a major bridge contractor. Constructibility should be the designers' responsibility and one feasible erection scheme should be included in the contract plans.</p> <p>An FHWA bridge engineer states that technical prequalification of bidders on complex bridge projects should be required and enforced. Arizona has charged several design consultants for the construction cost of design errors.</p>	Vandehey, Del Walley, Al Markich, George	
Kilian, Al	Session 218: Geotechnical Engineering	A series of papers on piling and drilled shafts was presented. Fragaszy's paper (WSU research for WSDOT) received little discussion, though Fragaszy is proposing a major change in evaluating pile capacity. Other papers offered no new information.	None	

**GENERAL**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Session 6: Quality Assurance — The Many Faces of Quality	Richard M. Weed of NJDOT discussed what it takes to have a successful quality assurance program. Three key factors are (1) technical knowledge, (2) leaders, and (3) people skills. One of the big pitfalls is that engineers and statisticians don't talk the same language. This may lead to misapplication of statistics. He suggested that what may be needed is a new job classification — engineering statisticians.	Vandehey, Del Strada, John Gietz, Bob	
Anderson, Keith	Session 6: Quality Assurance — The Many Faces of Quality	L. Denton of Denton Construction Co. discussed the problems that contractors face in producing quality construction. He pointed out that two of the biggest problems are (1) the lack of consideration by designers of the constructability of their designs, and (2) the lack of uniformity in designs that don't allow the use of the same equipment or equipment setup to do similar operations. He suggested that project designers and contractors work together to develop or review designs so that the project will be easy to construct and use uniform design elements.	Vandehey, Del Strada, John Gietz, Bob	
Carr, Bill	Conduct of Research Committee Meeting #A5001	<p>Much of the discussion was directed at the University Transportation Center Program. There needs to be additional attention paid to monitoring this program by the individual Center managers. A meeting late March/April has been planned for all ten Center directors, which will hopefully recommit many of the parties and supporters of the program. This meeting will be held at Turner-Fairbanks. It's still possible this program may be terminated by FHWA, but the hope is that it may become more an extension of HPR with involvement by all Divisions.</p> <p>Dave Phillips of FHWA reported that 1989 is a crucial year for R, D &amp; T. Important issues are the Post 1991 Hwy R, D &amp; T, and Post SHRP. Obviously, the LTPP is a 15-year program and SHRP has only been funded for 5. There needs to be some decisions made now so that all the programs may be meaningful in future years.</p> <p>Discussion is also being started on Post 1991 R, D &amp; T. Urban congestion is probably the greatest single coming issue. The use of the national laboratories (TF) needs to be resolved.</p> <p>SCORE will be heavily discussing post 1991 R, D &amp; T. The highway portion of the research is still the major share of the interest. SCORE needs to be positioned to support AASHTO 2020.</p> <p>Phillips predicts HPR will continue at about same level of funding approximately 200M, of which 1/3 is research and 2/3 is planning.</p>		

Attendee	Session Title	Comments	Follow-up Name	Comments
		<p>Bob Betsold talked about the need to focus on common research goals/objectives. There is wide disparity nationwide on how research programs are conducted, both at state DOTs and within the research community. Areas to concentrate on:</p>		
		<ol style="list-style-type: none"> <li>1. Program development — (REC's and RTC's)</li> <li>2. Research priorities and programs (NCHRP appears to be all hardside next year)</li> <li>3. Resource allocation</li> <li>4. Staff recruitment and retention of career ladders for experts. Many good experts don't make good managers — they shouldn't have to become managers just to get ahead.</li> <li>5. Fellowship programs — bringing researchers and research sensitive employees/managers along.</li> <li>6. Overcommitment of P.I.'s — some easily add up to 150-170% of their available time.</li> <li>7. Organizational structures</li> <li>8. Program outputs</li> <li>9. Pooled fund projects, especially regional problems.</li> <li>10. Future research manager's forum.</li> </ol>		
		<p>Tom Larson of Penn State University's comments summarized three emphasis areas for research:</p>		
		<ol style="list-style-type: none"> <li>1— The need to maximize business community's research accomplishments. Business R &amp; D in 1989 will only increase 4% versus 6% previously.</li> <li>2— Productivity must be measured in three to four year cycles. Particularly important since long term managers don't exist anymore.</li> <li>3— Technology transfer. Eliminate duplication of efforts.</li> </ol>		

Attendee	Session Title	Comments	Follow-up Name	Comments
Doyle, John	Joint meeting AASHTO Standing Committee on Research (SCOR) and the Research Advisory Committee (RAC) Research Program Development/Research Administration	The recently organized SCOR is up and running and meeting its goals. To a large degree, the RAC, which along with SCOR was established by AASHTO, is a committee in search of a job. There is a movement to break the RAC into regional committees to facilitate regional pooled fund research. In the west, there is utility in having the regional RAC serve as a research committee for WASHTO.	Doyle, J.	Doyle, J., to monitor events and provide staff support to Berentson, D. who serves on SCOR.
Doyle, John	Meeting of the Task Force on Post 1991 Research, AASHTO Standing Committee on Research Future of Transportation Research	<p><u>Expected Results</u></p> <p>The Task Force is expected to develop a comprehensive, well-documented, program-level plan for highway research beyond 1991. Accomplishment of the Task Force's responsibility will require completion of at least the following tasks:</p> <ul style="list-style-type: none"> <li>• Evaluate the effectiveness of current research programs that address transportation problems of interest to AASHTO and recommend appropriate improvements.</li> <li>• Evaluate the methods currently used to avoid undesirable duplication and gaps between transportation research programs and recommend steps to ensure necessary coordination.</li> <li>• Determine the most important needs and opportunities that should drive AASHTO's research priorities in both the short and long term.</li> <li>• Evaluate new initiatives intended to address current needs for improved transportation technology and innovation, and recommend positions for AASHTO on these initiatives.</li> <li>• Evaluate current and potential sources of funding for transportation research, development, and innovation programs and recommend a detailed plan, including future funding levels, for the programs of interest to AASHTO.</li> <li>• Analyze legislative alternatives to determine their potential impact on transportation research programs after 1991 and recommend new funding formulas and other provisions to maximize the effectiveness of the research system.</li> </ul>	Doyle, J.	Duane Berentson is a member of the Task Force. Monitoring and staff support will be provided by J. Doyle.

Attendee	Session Title	Comments	Follow-up Name	Comments
		<p><u>Schedule</u></p> <p>April - review of first draft by task force  - revision of draft  - review of revised draft by RAC and SCOR</p> <p>May - revision of draft  - approval of report by SCOR</p> <p>June - approval of report by Executive Committee</p> <p>July - approval of report by Policy Committee</p>		
Jacobson, Les	Session 48: Applications of Machine Vision and Image Processing	I stayed for the first presentation only. The presentation by Panos Michalopolous was on the University of Minnesota's work with Minnesota DOT to develop a video imaging system for wide area vehicle detection. The system uses closed circuit television for vehicle detection. The researchers have solved earlier problems of shadows, reflection, and occlusion. They will implement this detection system on MinnDOT's I-394 project.		None required. After MinnDOT tests and reports the results of its system, it may be worth considering a test site in this area. However, our detection systems are not nearly as at risk as the ones in Minnesota due to our less severe climate.
Russo, Barbara	No session #	Of primary importance to our library programs were two TRIS (Transportation Research Information Service) meetings. The first was held Monday, January 23rd, 5:00-7:00 p.m. It was primarily informational: an introduction of new TRIS Manager, Jerry Maddock; brief remarks from Margaret Graham, the consultant hired by TRB to evaluate the program; and some information on the most promising subfile, T-LIB, by Mike Kleiber, ITS Librarian and Mary Roy, Librarian, Northwestern University Transportation Center. Most encouraging was the attendance (full room) of engineers who use the information and obviously meant to show TRB management their support.	Russo, Barbara	

Attendee	Session Title	Comments	Follow-up Name	Comments
Russo, Barbara	TRIS Technical Session Tuesday, Jan. 24th, 9:00 a.m. — 12:00 p.m.	<p>This was an overview of the current organization of TRB information services, presented by the newly appointed Manager, Jerry Maddock. There followed specific discussions on the database and its problems by the attendees:</p> <ol style="list-style-type: none"> <li>1. Quality of the database: duplicate records, inaccurate records.</li> <li>2. TRIS database does not adequately cover the full range of transportation literature.</li> <li>3. TRIS requires a major marketing effort. To many, it is almost invisible.</li> <li>4. TRIS management requires access to more sophisticated data processing expertise. At present they are unable to consistently read and transfer OCLC tapes provided by ITS and Northwestern University Transportation Libraries. They have offers of tapes from the Port Authority of New York, U.S. DOT, and Canadian National Railway Libraries.</li> </ol>	Russo, Barbara	<p>Eight DOT librarians, two university librarians, and one association librarian attended. An internal decision appears to be pending on a choice of computer procedures that will, in the near term, engage most of their personnel and monetary resources. DOT librarians, working through their own departments and with SLA's Transportation Division, must continue to monitor, support, and critique TRIS progress.</p> <p>I also attended 2020 sessions (16 and 40) Monday morning and afternoon, primarily to provide myself with a better background in serving WSDOT personnel. Looked in on Session 111, Transportation and Economic Development, and Session 117, Port Planning and Intermodalism, Tuesday afternoon for the same purpose. Attended ITS reception late Tuesday afternoon to meet some of the research personnel.</p>

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Transportation 2020 — Part 1 Report on Results of TRB Conference	<p>20th century unparalleled in transportation development. Higher rates of capital investment needed — especially transportation Need to use better technology--better productivity. Keep user financing . . . long-term commitment a must. Work within existing political system. Heed demographics. Growth in South and West, and will be Hispanic, Black, Asian and aging. Plenty of petroleum worldwide; alternative fuels available. Extensive fixed rail (new) not expected. Labor shortages will be a problem. Truck drivers, etc.</p> <p>Daniel Brand — unresolved issues---Conference objectives probably <u>not</u> really met — Didn't come up with the answers. Must establish a linkage with economic growth. Labor productivity needed. No pork barrel projects not linked to economic growth. The way to get 3.5% GNP growth is through labor productivity. Transportation a big part of this. Fred Miller says vision needed . . . new goals . . . what is it? Brand says it will relate to computers . . . automation of transportation. Must perform existing task better. Do we really measure productivity correctly? Do we price it right? Prices less than cost lead to overconsumption. Reduced congestion will further disperse development.</p> <p>Peter Koltnow — Maybe "intelligent vehicle, automated highway" will be new "engine of change" that will spark public and congressional interest. FHWA working paper #7 outlines 5 techniques. Doomsday is <u>not</u> upon us . . . we're doing OK . . . e.g., commute times in L.A. are only 1 minute longer (average) than 20 years ago.</p> <p>We must develop these electronic tools; stand back and see what unforeseeable uses are made of them.</p>	Berentson, Duane Ferguson, Ed Toohey, James	

Attendee	Session Title	Comments	Follow-up Name	Comments
		<p>Steve Lockwood — No national transportation policy. Protect and preserve what we have (broad consensus on this).</p> <p>Manage . . . improve operations, improve balance with land development (also a lot of consensus)            Extend/supplement networks            Relate investments to economic development            Focus on improved efficiency/development            Where to find the resources? . . . <u>Needs to be increased.</u>            Maintain user responsibility; more efficiency; need stable funding; balance of sources.            External: safety, environment, energy.            Institutional — model, interagency, public/private, all levels, flexible (No specific policy options covered).            Q and A — motor vehicle industry needs to be involved.</p>		
Senn, Don	Committee A1A02 — Committee on Manpower Management and Productivity (Ken Cucchiare, Committee Chair; New Jersey)	<p>I. Paper Review</p> <ul style="list-style-type: none"> <li>A. WSDOT Paper being presented this p.m.</li> <li>B. Tech transfer being presented this p.m.</li> </ul> <p>II. Need to Decide Committee Make-up</p> <ul style="list-style-type: none"> <li>A. Secretary no longer with us — not much done</li> </ul> <p>III. Concepts From Last Year</p> <ul style="list-style-type: none"> <li>A. More use of consultants (contracting out)</li> <li>B. Human resource issues in transportation               <ul style="list-style-type: none"> <li>1. Office automation (computer use and hardware affecting productivity)</li> <li>2. Right to know act</li> </ul> </li> <li>C. Office automation and role of clerical</li> <li>D. Drug free work place</li> <li>E. Engineer equipment updates (CADD, etc.) — do they increase productivity</li> <li>F. Training — What is a good program</li> </ul> <p>IV. Criteria Used to Evaluate Automation (CADD and Office P.C.)</p>	Executive Management and John Davis	

**HIGHWAYS**

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Noon Tuesday — Lone Star Pyramment — lunch and demonstration		Vandehey (we need to try some of this)	
Schuster, Bob	Session 106: Current Tunneling Projects	<p>Mohammed Irshad (Washington Metro) — Segmental tunnel liner — 16'8" I.D. 10" thick 5- to 60-degree segment, 1-45°, Key — 15°, 4' long, staggered joints. Close tolerance on segments and P gaskets (1/32"). Latest contract used 8,000 lbs concrete and galvanized rebar.</p> <p>David Kelley — I-664 tunnel — Newport News, VA. — tunnel-viaduct crossing of Hampton Roads. 26' curb. 15 double tube segments 300' long. 10 segments in (1 today) — 3 more years construction.</p> <p>Gary Brierley — Berthoud tunnel — not yet under construction. Attempting to privatize..no Federal funding; maybe some state money. Connects Denver and Winter Park on U.S.40. In August 1988, prime sponsors decided not to proceed. New group now set up. 230M bond issue. 4 miles long, 2 lanes, 26' curb to curb. No hazardous materials allowed.</p> <p>Jim Hamilton (Michael Baker) — Tunnel rehabilitation. Do homework; put together good, complete plans; don't be adversary to contractor. Expect change. Start with complete inspection (should be ongoing). Talk to many people. Payment should parallel cost--Be generous with contingencies. Prequalify financially, and require references. Require specifically named personnel.</p>	Gloyd, Stew Bockstruck, Ron	Last session might be of some help for Mt. Baker Tunnel rehabilitation

Attendee	Session Title	Comments	Follow-up Name	Comments
Smelser, Arthur T.	Session 4: Roadside Management	<p>Dr. Charles Reese of EPA reported on Pesticide Application Training and Certification. The goals are prevention of incidents and accidents, not regulation. The regulations are developed with these goals in review.</p> <p>Revised regulations are being developed and could now be obtained for informal comment. Later this summer they will be published in the Federal Register for the formal comment period.</p> <p>Some of the revisions are as follows:</p> <ol style="list-style-type: none"> <li>1. Requirements for private applicators are being upgraded.</li> <li>2. Instructions are being developed for handling containers with broken seals.</li> <li>3. Definitions of direct supervision are being detailed.</li> </ol>	Berger, Bob	
Smelser, Arthur T.	Session 81: Measured Effects of 65 MPH Speed Limit on Posted Segments of Rural Freeways	<p>Mr. David Skinner of the U.S. Department of Transportation reported on a national survey of data gathered from the states on the effects of the 65 MPH speed limit change.</p> <p>Thirty-six percent of the vehicles exceed the 65 MPH limit now as compared to 22 percent before the speed limit change.</p> <p>The 1987 data from the 38 states that adopted the 65 MPH speed limit indicate an 18% average increase in fatalities [227 lives (point estimate)]. The change was not constant. Some states had no increase and some had increases as high as 40%.</p> <p>The indicated increase, however, is not statistically significant and could be only an annual variation. The WSDOT needs more base data, and therefore will be requesting more data from the states.</p>	Gruen, Wayne — handout is attached	

Attendee	Session Title	Comments	Follow-up Name	Comments
Smelser, Arthur T.	Session 102: Operational Effects of Geometrics	<p>Mr. Christopher Squires reported on a comparison of accidents on roads with raised medians versus two-way left turn lanes. For four through-lane sections, the section with the two-way left-turn lane had 4.02 accidents per million vehicle miles (MVM) compared to 3.86 accidents per MVM for the raised median (New Jersey Barrier). The sections studied had traffic signals from one to five miles apart. As the number of signals and number of driveways increased, the difference in the accident rate decreased.</p> <p>Mr. Thomas Batz reported on a study in New Jersey of a traffic control method to move all drivers to the right at the beginning of passing lane sections on basic two-lane highways. New Jersey had been experiencing considerable violation of its "slow moving vehicle move right law." It installed a painted gore at the beginning of several test sections and studied the accident and operational characteristics for one year. It used video for operational analysis. The results were fewer violations (most traffic moved right initially) than before and somewhat fewer accidents; however, there is not enough information to be statistically significant. A few drivers violated the gore striping, but most slow vehicles moved right and stayed right.</p>	Gruen, Wayne Lund, Don	

**MATERIALS**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Session 191: Concrete Bridge Deck Overlays — Concrete and Construction	David Whitting of Construction Technology Lab reported that chloride permeabilities of rigid concrete bridge deck overlays were measured on 25 bridges in Ohio. The overlays were of three types: (1) latex modified concrete, (2) low slump dense concrete, and (3) silica fume concrete. The silica fume concrete overlays were the most impermeable of the overlays, followed by the LMC and then the LSDC. These data agree with work done in our state on rapid chloride permeabilities on our own deck overlays.	Henley, Ed	
Babaei, Khossrow	Session 101: Steel bridges  A case of dropping deflection control criteria from highway bridges (Baidar Bakht, Ontario Ministry of Transportation)	According to the speaker, excessive superstructure deflections do not cause bridge deck cracking. This opinion, however is debatable. The speaker believes that the most important criterion should be to move the natural frequency of the structure away from the range of frequency expected from most of the commercial vehicles. In some cases this may be done by permitting higher deflections.	Lwin, Myint Henley, Ed	
Babaei, Khossrow	Session 220: How microsilica affects the durability of high-strength concrete	The freeze-thaw durability of non air-entrained microsilica concrete is satisfactory. Both the durability and deicer scaling resistance are good. This is mainly because of the impermeability of the concrete, which prevents intrusion of moisture. However, in field-made concrete, moisture can be present in the aggregate. Thus, at least 3.5% of entrained air is necessary to get a 100% durability factor.  The wear resistance of microsilica concrete is mainly a function of the type of aggregate used in the mix. Concrete with granite has less wear than concrete with limestone. Also, air entrainment increases wear resistance. Wet concrete shows more wear than dry concrete, but at a compressive strength of about 14,000 psi, wet and dry concrete have the same wear resistance because of the density of the concrete.  Reactive aggregate can in time cause cracking of the microsilica concrete, if the concrete is to be exposed to moisture. The threshold expansion of 0.05%, which causes cracking, can occur in 1,500 days for microsilica concrete, while it can occur in about 100 days for conventional concrete.  Microsilica significantly reduces the rate of corrosion of steel in concrete. This is because of both its low permeability and high electrical resistivity.	Henley, Ed Anderson, Keith	

Attendee	Session Title	Comments	Follow-up Name	Comments
Gloyd, C.S.	Session 131: Fiber Reinforced Plastic for Structural Applications	The structural applications of fiber reinforced plastics are becoming popular for research and experimental use. Structural beams are available in relatively small sizes. Rods are produced using Kevlar or fiberglass suitable for prestressing concrete. Entire structures of plastic have been used in China for pedestrian bridges. Potential exists for non-corrosive structural systems, especially in bridge decks, ground anchors, and some prestressed concrete members. More research and development is needed. A continuation of TRAC research should be considered with support from industry.	Rutherford, Scott Henley, Ed	
Henley, Ed	Session 131: New Structural Applications of Fiber-Reinforced Plastics	In recent years, the uses of fiber-reinforced "plastics" (FRP) has included a range from the use of a complete prefabricated FRP main span of a pedestrian bridge in China to the use of "fiber-reinforced E-glass epoxy" rod post-tensioned bridges in Germany and "standard" shapes of pultruded structural members. Development of design criteria and standards for the use of the non-corrosive FRP materials is in progress, but now lags the technological ability to produce these "modern" structural materials.		<p>WSDOT (Bridge) has submitted a Stage I proposal to NCHRP for FY 90 for a synthesis on the FRP materials and systems available and under development and on in-progress research of design parameters and construction consideration.</p> <p>The use of FRP prestressing rods for new bridge superstructures subject to marine environments would have value to WSDOT; additional research through TRAC to further develop appropriate design criteria and development of an experimental installation warrant consideration within the next two bienniums.</p>
Jackson, Newton	Committee A2D04: ACP Mix Design	Harold Von Quintes of Brent Rauhut Engineers Inc. presented a summary of Part 1 and 2 of the AAMAS (Asphalt Mix Design) study. Not much new or exciting. They have developed a procedure to check either a Hveem or Marshall design procedure using cheap modules and tensile strength. Same general disappointments voiced by several over the results of the study so far.	Walters, Jim	

Attendee	Session Title	Comments	Follow-up Name	Comments
Jackson, Newton	Session 219: Asphalt Cement Content	Mary Stroup-Gardiner gave a presentation on "Precision of Methods for Determining Asphalt Cement Content." They compared the precision of various extraction procedures to that found in the new nuclear gauges. They found only minor differences in precision for the various extraction procedures where low absorptive aggregate was used. Where high absorptive aggregate was tested, more variation was found, with the centrifuge process giving the highest variability. The new nuclear gauges were found to have significantly lower variability than any of the extraction procedures.	Gietz, Bob	
Jackson, Newton	Session 219: Drum Dryer ACP Plants	Brian Chollar, FHWA, gave a presentation on the "Changes Occurring in Asphalt in Drum Dryer Mixing Operations." In their study, they looked at a very large array of asphalt test properties resulting from different plant mixing operations and also those resulting from different laboratory conditioning procedures. In general, they found that the Drum Dryer mixing process oxidized (hardened) the asphalt more than batch or continuous plants. Their study also clearly showed that the Rolling Thin Film Oven (RTFO) laboratory conditioning procedure came closest to representing the changes documented in the Drum Dryer mixing process compared to all other conditioning procedures including the normal Thin Film Oven procedure.	Gietz, Bob	
Kilian, Al	Session 68: Geomembranes and Silt Curtains in Transportation Systems	A suite of papers on impermeable geotextiles as moisture barriers was presented. They have some application to District 5. Case histories were presented of poor experience when the barrier stopped at shoulder. It's best to carry it to the ditch and line ditch. This system is better than vertical barriers. A paper on prototype turbidity curtain was presented. The fabric became a barrier and clogged. It may have future application at ferry terminals.	Information Transfer Geotechnical to District 5 and Marine	
Kilian, Al	Session 165: In-Situ Testing of Soil Properties for Transportation Facilities, Part 2	A paper on the correlation of field tests and design soil parameters was presented. It was a useful summary for entry level geotechnical engineers. Two papers on cone penetrometer data for pile lateral load design and soil identification correction was given. They could be useful to WSDOT in implementing its new Dutch Cone Penetrometer.	Internal Geotechnical Section Study	
Kilian, Al	Session 201: Innovative Earth-Retaining Systems	No new wall systems to WSDOT. Texas has a series of projects using small diameter (18 inch) cantilever drilled shafts in shallow (<15' deep) slides. Their general wall costs seem comparable to ours, yet the shaft walls were quoted at \$12/ft. If we could do it at their cost, the design may be useful on I-5 south of Tukwila.	Geotechnical Section and Bridge and Structures check on WSDOT cost.	

**OPERATIONS**

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Attendee	Session Title	Comments	Follow-up Name	Comments
Henry, Kim	Session 178: Management and Administration of State Programs: Safety, Innovation, and Manpower	I presented a paper, "A Personnel Scheduling Management System for Washington State Department of Transportation Construction Field Offices," for Meg Blau. While I worked with Meg in advance, I found this to be a very uncomfortable position. This was a subject area I was not familiar with and I did not have the time to go back and familiarize myself with the entire research process. As a result, I gave a broad overview of the paper and had to stay away from details. Fortunately, I was familiar enough with DOT procedures to answer all the questions that came up at the end of the session. In my opinion, only authors or people intimately familiar with the paper should be making presentations at the national level.		

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 124: Issues in Contract Administration	<p>Darrell Harp — (New York) — Post Qualification. Among other things, NY considers "A record of Satisfactory Performance." Sample Pre-Award questionnaire handout. Bid review done by CRU — Contract Review Unit.</p> <p>Pros and Cons of Post vs. Prequalification: Repeated disqualifications take a lot of time; often result in Litigation (I must have missed the Pros!).</p> <p>John Waltz (NJ) — Prequalification--to consider <u>past performance</u> among other things. Jacob Isler talked about prequalification form and revised financial requirements. Performance reviewed by 3 engineers and four accountants. A record of poor performance, either in New Jersey or elsewhere, or of their personnel, means disqualification--0 to 5 years. Any subcontractor doing over \$200,000 must be prequalified.</p> <p>Joe McAtee- Incentive — Disincentive . . . viewpoint of Construction Management Consultant. Listed some claims avoidance techniques, i.e., immediate action on issues requiring direction, legal workshops, project control system. Innovations — CPM, weekly meetings, 7-day turnaround for shop days, radio communication. Emphasis on public relations. Pay items for towing-reimburse local police. This kind of job <u>requires</u> special treatment.</p> <p>Charles Larkin — Contractor on above job. What's important — Communication, knowledgeable people, excellent control. Don't do it unless <u>really</u> beneficial to traveling public. Contractor <u>must</u> be in control. Avoid arbitrary, hard-nosed approaches. Don't try new techniques. Short-range jobs like rehabilitation best. Avoid added work. Quick and final decisions. Avoid utility work (out of contractor control). Weekly job-level meetings very beneficial. Prequalification of Contractor <u>and his people</u> is very important.</p> <p>Sam Knight (Sumarth Nalk) — Robotics — Not used in Highway Construction in U.S. Some being done in Japan. Suggested some operations that could be done by robots, and a few that are already being used. We should do more.</p>	Vandehey	

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Committee A3C01: Maintenance and Operations Management Next year's agenda, cut-off dates, etc. Will be sent out with minutes.	<p><u>Presentations</u> — <u>Cost Study</u> — Michael J. Markow — possible revisions to Maintenance Cost Index report (see handout). Survey has been completed and sent to FHWA. Recommendation coming. Will be to produce simpler index based on 10 or 12 items. Workshop coming up on this topic, probably in June, sponsored by FHWA.</p> <p><u>Committee Focus and Paper Review Process</u> — Ken Brewer (see p. 4 of Agenda). Unfocused discussion on what "purpose" of committee is. Should we change it? Ken will tinker with purpose statement. Add information, exchange, and co-ordination. Will tune objectives to match purpose statement.</p> <p>Suggested review form (last 2 pages of agenda) accepted to try for a year or two.</p> <p><u>Conference Session 27 Sponsorship</u> — John S. Jorgensen. Over 100 in attendance. Overlooked the presentations. Suggested that quality issues may be good topic for a workshop.</p> <p><u>Interaction with AASHTO</u> — Tom Cam — out of 13 Problem Statements, 4 have been incorporated into NCHRP suggested projects through Standing Committee on Research (2 projects). Other 9 to be reviewed, updated, re-prioritized. Method suggested by Adrian Clary.</p> <p><u>Future Maintenance Management Workshop</u> — Adrian Clary — AASHTO Committee is for it. Wants to include PIARC too. Maybe in 1990 in Mississippi. Consensus was yes.</p> <p><u>Paper Reviews</u> — Very little commented — voted to host a session next year. Burt will honcho. Productivity and motivation suggested topics.*</p>	Ingham, Dennis	
		*Toppenish Crew??		

Attendee	Session Title	Comments	Follow-up Name	Comments								
Smelser, Arthur T.	Session 27: Quality Issues for Maintenance	<p>Leland D. Smithson, State Maintenance Engineer for Iowa DOT, reported on a maintenance quality evaluation program which Iowa has developed and uses to evaluate its maintenance effort and provide incentive for managers and crews.</p> <p>Iowa surveys a representative sample (10%) on a random sampling basis (one mile sections) every year. The survey team consists of two people, one who is from the Headquarters Maintenance Office and repeats each year. The other is a staff level professional who changes each year.</p> <p>The evaluation looks at four areas that constitute 80% of the expenditures and are weighted according to established priorities:</p> <table data-bbox="844 662 1077 768"> <tr> <td>Pavement</td> <td>40%</td> </tr> <tr> <td>Shoulders</td> <td>30%</td> </tr> <tr> <td>Traffic Services</td> <td>20%</td> </tr> <tr> <td>Roadside</td> <td>10%</td> </tr> </table> <p>Awards are made annually to the top three areas in the state. The results also show changes in the levels of funding.</p> <p>Mr. Smithson will be sending material on how they do this.</p>	Pavement	40%	Shoulders	30%	Traffic Services	20%	Roadside	10%	Ingham, Dennis	
Pavement	40%											
Shoulders	30%											
Traffic Services	20%											
Roadside	10%											

**PAVEMENT**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Committee A2B03: Flexible Pavement Design	Dr. George Sousa of UC, Berkeley, presented a study of the dynamic response of truck suspensions that further expanded the growing knowledge base relating to the differences in pavement loadings imparted by different truck suspension systems. This type of presentation points out the need for interaction between pavement designers and truck designers.	Jackson, Newton, Mahoney, Joe (TRAC)	
Anderson, Keith	Session 103: Expert Systems for PMS — Pavement Management, Part 3: Management Models	Hoisin Lee of WSU explained the use of an expert system to help local communities interface with a pavement management system. The expert systems add understandability to the PMS database systems and allow local, non-technical users to have access to the information.	Jackson, Newton	
Anderson, Keith	Session 122: Flexible Pavement Design — Flexible Pavement Design and Evaluation Factors	Peter Sebaaly of the Pennsylvania Transportation Institute presented a study that showed that resilient modulus was reduced by 50% before initial cracking developed on the surface of the pavement. The researcher indicated that the results showed a correlation between deflection under load and cracking, which could be used to decrease the need for deflection measurements. These data also support our policy of early programming of rehabilitation based on cracking.	Jackson, Newton	
Jackson, Newton	Committee A2B03: Tire Pressures	Presentation by Mr. Pete Yap, Goodyear Tire and Rubber Co. on "A Comparative Study of the Effect of Truck Tire Types on Road Contact Pressures." Mr. Yap gave a very clear paper on the ground contact pressures of various tire types. Their studies show that the ground contact pressures for normal radial versus bias ply are about the same, though the radials carry higher air pressures. However, their studies show quite high contact pressures for wide base single tires and the new low profile duals. The wide based singles had ground contact pressures almost twice their inflation pressure.	Ingham, Dennis	
Jackson, Newton	Session 108: Single Versus Dual Tires	Matti Huhtale, Road and Traffic Laboratory, Finland, presented a summary of research on pavement stress measured at their test track for various tire types. They have clearly done some very good work in instrumentary pavements. Their data clearly show that the strain at the base of the ACP was about twice as high for a single wide based radial tire as that for a normal dual radial configuration. They also showed higher stresses from the new low profile duals.	Ingham, Dennis	
Jackson, Newton	Session 198: Concrete Pavement Restoration	K.T. Hall presented a paper on "Rehabilitation and Cost Effectiveness, a Ten-Year Case Study," which looked at the cost effectiveness of various PCCP rehabilitation techniques in different states. The general findings were, <i>generally</i> , that most rehabilitation strategies only lasted at best 5 to 8 years. The shortest or worst performance came from partial depth patches and grinding. The best performance came from full depth patching.	Kay, Keith	

Attendee	Session Title	Comments	Follow-up Name	Comments
Kilian, Al	Session 103: Pavement Management, Part 3: Management Models	A suite of papers on pavement management models. The models presented were simplified basic models for small agency usage. Numerous technical concerns were raised by the audience. They had little value to WSDOT at this point.	None	
Senn, Don	Session 12: Pavement Maintenance Management (Tom Maze, Iowa State University)	<p>Pavement management history in Iowa, Arizona and Pennsylvania</p> <p><u>Iowa:</u> Road Rater Matrix of seven factors Located in Materials Office (centrally located) Operating Cost \$500,000 (1987 cost)</p> <p><u>Arizona:</u> PMS Sophisticated System — Heuristic Model Material Lab manages Program developed centrally \$300,000 (1979 cost)</p> <p><u>Pennsylvania:</u> System developed in nine months PMS System — 5 conditions as per Arizona Cost: No figure</p> <p><u>Findings:</u> Iowa: Slow, no growing Arizona: Consultant start Pennsylvania: In-house, decentralized</p> <p><u>Recommendation:</u> 1. Top management commitment 2. Educate staff 3. Bottom up approach 4. Strong central support</p>	Newt Jackson should monitor. It appears Washington state is in the lead in this area.	

Attendee	Session Title	Comments	Follow-up Name	Comments
Senn, Don	Session 12: Routine Maintenance Expand Level on Pavement Service Life (Professor Kamares Sinha, Purdue University)	<p><u>Basic Approach</u></p> <ol style="list-style-type: none"> <li>1. Pavement roughness a direct measure</li> <li>2. Highway class</li> <li>3. Data Base Approach</li> </ol> <p><u>Recommendation:</u></p> <ol style="list-style-type: none"> <li>1. Maintenance Expenditure can postpone resurfacing</li> <li>2. Maintenance Expenditure more cost effective on highways other than Interstate</li> </ol>		
Senn, Don	Session 12: Life Cycle Cost and Performance Evaluation (Essam Sharaf, Cairo University)	<p>Design alternative to provide <u>adequate</u> performance</p> <p><u>Types of Maintenance:</u></p> <ul style="list-style-type: none"> <li>Routine (scheduled)</li> <li>Responsive (unscheduled)</li> </ul> <p>Pavement Design and Management Tied</p>		
Senn, Don	Session 32: Pavement Management Part 1: 1986 (AASHTO Guide Implementation of AASHTO Guide at the City and County Level) (Eqbal Charania and Joe O. Cano)	<ol style="list-style-type: none"> <li>I. Phoenix Using             <ol style="list-style-type: none"> <li>A. Poor correlation with dynaflex</li> <li>B. Corps of Engineers having better results with FWD</li> </ol> </li> </ol>	State Aid Office as well as Design	

**PLANNING**

Attendee	Session Title	Comments	Follow-up Name	Comments
Smelser, Arthur T.	Session 160: Economic Impacts of Port Development	<p>Two basic types of economic impacts must be considered when analyzing port development, direct or indirect impact on the larger economy. A recently developed, nationally recognized computer model is available to determine the direct impacts.</p> <p>In studies the Corps of Engineers has done, there appears to be a close correlation between the level of economic activity and the level of infrastructure that must be in place to allow the economic development to occur.</p>	No referral necessary	
Ulberg, Cy	Session 111: Transportation and Economic Development	<p>There is significant evidence in the literature that investments in transportation infrastructure lead to economic development. However, a lot of research in this area seems to suffer from careful consideration of the direction of causation. The type of analysis discussed in this session would be useful for developing information for legislators making decisions on transportation investments. The paper by Donald Drew is a useful summary of methodologies available for analysis. However, it wasn't published as a preprint.</p>	Ulberg, Cy	

**SAFETY**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Session 171: Clear Zones — Highway Rights-Of-Way: Safety in the Clear Zone and Utility Installations	Daniel S. Turner of the University of Alabama presented a survey that was conducted on state utility manual clear zone provisions to make sense out of the diversity of standards used throughout the U.S. The applicable standards included (1) FHPM 6-6-3-2, (2) 23 CFR 645, (3) AASHTO, and (4) state and local standards. AASHTO alone has the following list of publications that pertain to clear zones: (1) 1981 Accommodation Guide, (2) 1982 Freeway Policy, (3) 1974 Barrier Guide, (4) 1980 Barrier Guide Supplement, (5) 1977 Purple Book, (6) 1984 Green Book, and (7) 1988 Roadside Design Guide. Confusion and resistance to clear zone implementation result from concerns over cost, multiple standards, constant changes to standards, lack of a simple exact criteria, crowded rights-of-way, existing facilities, and emerging liability issues. The author recommended a nationwide standardization of clear zone philosophy.	Gripne, Don	
Carr, Bill	Clear Zones TRB Session #171	Daniel S. Turner of the University of Alabama presented a study that was conducted in Huntsville, Alabama which conclusively showed that its not possible to develop one comprehensive strategy for minimum lateral clearances of all poles. Instead, specific policies for specific types of poles need to be developed and can be effective both for new construction and existing installations. Priority arrays of safety and cost-benefit ratios help to establish a strategy.	Anderson, Keith	
Senn, Don	Committee A3C04 — Committee on Traffic Safety in Maintenance and Operations (Russell Lewis, Chairman)	<p>I. Part six of MUTCD to be rewritten this summer</p> <p>II. Claude Bodaise of France gave report of Work Zone Safety and Traffic Control</p> <p>A. Need to know exact location of accidents</p> <p>B. Model experiences (which one to use)</p> <p>C. Need for preparation and coordination</p> <p>1. Traffic more important than how to manage work site</p> <p>2. Coordinate stages of work zone</p> <p>D. Monitor and inform drivers and workers</p> <p>E. Make work zone more realistic — design to driver's expectation</p> <p>F. Make and modify equipment which can be operated and maintained</p>	State Traffic Engineer	



Attendee	Session Title	Comments	Follow-up Name	Comments
Carr, Bill	Advance Vehicle and Highway Technology TRB Session #85 - Panel	<p>Damel Brand, chair of Charles River Associates, Inc., gave some really interesting remarks about the progression of transportation breakthroughs. Historically, a major change in transportation has occurred every 50-75 years in the U.S.</p> <p>1850: Railroads were developed  1900-20: Automobiles  1950-60: Interstate Highway System and Airline Industry  2000-20: Automated Vehicles?</p> <p>Excellent food for thought in terms of preparing future program discussion papers.</p>		
Senn, Don	Session 15: Strategic Management Report on November Performance Measures Implementation Workshop (Jim Guenther, Washington State)	<p>I. Must be supported by CEO</p> <p>II. What is Strategic Management  A. Process to get to long range plan (Washington)  B. Oregon — long range overview</p> <p>III. Organizational  A. Process to get to long range plan (Washington)  B. Informal — Top spreads responsibility down to lower management</p> <p>IV. Performance Measurement  A. Real challenge to do long range planning (decisions) with less than real data  B. Periodic reporting — objectives reviewed every two years</p>	WSDOT Executive Managers	

Attendee	Session Title	Comments	Follow-up Name	Comments
Senn, Don	Session 40: Transpo 2020 Part 2 — A Program Report: The Transportation Investment Requirements Studies (The Transportation Alternatives Group: State of Consensus Policy Development) (Thomas W. Bradshaw, First Boston Corporation, TAB Chairman)	<p><u>Members give individual reports</u></p> <p>A. Teamwork important — cities, counties, states, etc.</p> <ol style="list-style-type: none"> <li>1. League of Cities                             <ol style="list-style-type: none"> <li>a. congestion number one problem                                     <ol style="list-style-type: none"> <li>1. Interstate traffic forced to use local system</li> </ol> </li> <li>b. Transit program should be separate</li> <li>c. Oppose using transit fund to reduce budget</li> </ol> </li> <li>2. National Governors — Charilyn Cowen</li> </ol> <p>B. AASHTO — F. Francois</p> <ol style="list-style-type: none"> <li>1. Four-phase program under way or complete</li> <li>2. Emphasis on safety</li> <li>3. States held harmless at 1991 level</li> <li>4. 90% level funding of states</li> <li>5. Flexible program needed</li> <li>6. Jointly administered by states and local</li> </ol> <p>C. Counties — Bob Fogel</p> <ol style="list-style-type: none"> <li>1. Need program that addresses urban/suburban problems</li> <li>2. Rural access — is a Federal concern</li> <li>3. Economic Development</li> <li>4. Separate bridge program</li> <li>5. Transit</li> </ol> <p>D. States — Rebecca (Nicki) Brady</p> <ol style="list-style-type: none"> <li>1. Hard to get states to agree themselves on what program should be</li> <li>2. States concerned about gas tax used to reduce federal deficit</li> <li>3. Eliminate sanctions and take trust funds off budget</li> </ol>	Planning, WSDOT Executives	

Attendee	Session Title	Comments	Follow-up Name	Comments
		<ul style="list-style-type: none"> <li>E. Automobile Association of America — John Archer               <ul style="list-style-type: none"> <li>1. Oppose raising gas tax to balance budget</li> <li>2. Traffic congestion</li> <li>3. Scenic Road program important to tourism</li> <li>4. Highway safety</li> <li>5. Against toll roads, support pay as you go</li> </ul> </li>   <li>F. American Public Transit Association — Jack Gilstrap               <ul style="list-style-type: none"> <li>1. Federal policy must be responsive                   <ul style="list-style-type: none"> <li>a. Air quality</li> <li>b. Unwillingness to break away from traditional modes</li> <li>c. Unprepared to break away from fossil fuels</li> <li>d. Land use and development must be linked to transportation</li> <li>e. More flexibility in categorical programs</li> </ul> </li> </ul> </li> </ul>		
Smelser, Arthur T.	Session 185: The Transportation Work Force for the Future	<p>Mr. Lowell Jackson reported for the Federal Highway Administration and Francis B. Francois reported for AASHTO.</p> <p>Over the last decade, Transportation Departments and FHWA have been experiencing a serious decline in numbers of experienced Professional Engineers. Also, there is a decline in Civil Engineering graduates, and the competition from private industry is attracting most of them. Early retirement is causing some of the shortage; however, many are moving to consulting and are still available in the larger work force.</p> <p>The recommendation is to work with schools at the junior high and high school level to help students recognize the interesting challenges of the Civil Engineering profession. Also work on incentives to retain experienced professionals in the state DOTs.</p>	Ferguson, Ed	

**TRAFFIC**

Attendee	Session Title	Comments	Follow-up Name	Comments
Anderson, Keith	Session 23: Weigh-in-Motion — Recent Advances in Sensor Technology	Douglas Kehrahn and Peter Radice of Pennwalt Corporation presented recent advances in the development of Piezofilm for use in highway sensor technology. Piezofilm develops an internal charge with applications of stress to the film or changes in temperature. The film can be designed to act as a switch, a weight sensor, or a temperature sensor. These unique properties make Piezofilm ideal for weigh-in motion and vehicle classification applications. They have available a portable and a permanent system, which we should check into for our WIM program.	Gupta, Kris Hallenbeck, Mark (TRAC)	
Anderson, Keith	Session 207: Weigh-in-Motion — Equipment and Activities	A.T. Papagiannakis of Memorial University, St. John's, Canada, presented a study involving the use of a truck instrumented to measure dynamic loading that was run over a WIM Piezocable installation. The primary point of the study was to show that it is impossible to compare the static weights of a truck with WIM equipment that measures dynamic weights. This is one of the most difficult concepts for many to deal with and a source of arguments over the "accuracy" of WIM equipment. Report should be a good reference.	Gupta, Kris Hallenbeck, Mark (TRAC)	
Henry, Kim	Traffic Management and Planning for Freeway Emergencies and Special Events	This day long conference covered Freeway Incident Management Programs in Toronto, Chicago, and Los Angeles. It also covered Incident Management as it relates to law enforcement agencies. There were only a couple of items covered in this conference that are not part of our current procedures or under consideration as part of our Incident Management Program. The key points were planning and team work. I will be putting together a detailed briefing for District Personnel involved with Incident Management.		
Henry, Kim	Session 5 Freeway Operations	The best presentation of the session was given by Les Jacobson. The paper was well received and interest has been expressed in trying to implement our algorithm in the Toronto area. I have also heard from Minnesota DOT and they are evaluating the algorithm to determine if it might be applicable to their situation. The presentation by Fred Hall on Speed Estimates Made With Single Detector Data may prove useful. We need to look into this further and follow the research efforts. The presentation by Ana Gall on distinguishing between incident congestion and recurrent congestion is important to incident detection. This work should also be closely followed as it may prove useful.		
Henry, Kim	Committee A3209 Freeway Operations	The meeting was well attended with a total of 61 attendees. The meeting started off by giving system updates. New Subcommittee assignments were made and I will be on the Traffic Management Subcommittee.		

## 68th Annual TRB Meeting

Attendee	Session Title	Comments	Follow-up Name	Comments
Henry, Kim	Session 60 Applications and Research in Advanced Vehicle and Highway Technologies	This session covered both smart cars and smart corridors or roads. There were some interesting presentations made that generated a fair amount of discussion. Some of the ideas will most likely be in our future and are currently under consideration in our NCHRP research project.		
Henry, Kim	HOV Task Force Meeting	<p>This Task Force is in the process of trying to upgrade to a full committee. There was a lot of discussion as to whether this committee should be in a Group 3 or Group 5. The final consensus was that it should be in Group 5. In up-grading to a committee, there are going to be a number of new appointments made.</p> <p>Don Capelle, Task Force Chairman, stated they would like to add people that have been involved with the Task Force activities and are involved with HOV issues/facilities. This will prevent them from having to re-invent the wheel. Bill Roach from METRO is on the Task Force and it would be recommended to have someone (possible John Conrad) from DOT to serve on the new committee.</p> <p>Everyone at the meeting gave a brief account of HOV issues in their area.</p> <p>Items of Interest:</p> <ul style="list-style-type: none"> <li>• The Shirley Highway Carpool definition has recently changed from 4 to 3+. No perceptible change in service occurred.</li> <li>• Virginia DOT has implemented the HERO Program. They did not do much in the way of a public information program and are having a few problems as a result. First time violators are sent a letter that starts with -- Dear Violator: (This is considerably different from the approach we have taken with sending first time violators information only on HOV lane system).</li> <li>• Houston has recently changed the HOV definition on the KATY freeway from 2+ to 3+. They were concerned about the change and were geared up for problems. The switch was problem-free and it was considered to be a non-event that barely made the local news.</li> <li>• Minneapolis will be converting shoulders on 3 sections of I-394 to establish an HOV lane.</li> </ul>		

Attendee	Session Title	Comments	Follow-up Name	Comments
		<ul style="list-style-type: none"> <li>• Honolulu is apparently the only location in the country where contra-flow HOV lanes are being designed. Currently they are incorporating the contra-flow lanes into two different highway projects.</li> </ul> <p>The meeting ended with discussions of the HOV newsletter and the next HOV conference. John Conrad was listed as a possible contributing author to the newsletter. The next conference will probably be held in conjunction with the next annual TRB Meeting in January.</p>		
Henry, Kim	Committee A3A09 Freeway Operations	<p>The second committee meeting dealt with Committee business as well as activities in other committees that may affect Freeway Operations. Wayne Berman (FHWA) was announced as the new TSM Committee Chairman and there was discussion on the new AASHTO Highway TSM Committee. Other committee business included discussions of status reports (no format or size requirement), updating the National Listing of Freeway Operation Projects, and scheduling of the Traffic Management Conference. There was also discussion of some FHWA research topics. The mid-year meeting will be held June 26th &amp; 27th in Minneapolis and the 1990 mid-year meeting will be in Houston.</p>		
Henry, Kim	Session 126	<p>I attended two paper presentations in this session. These papers presented some rather complex theories on traffic flow based on chaos and catastrophe. The paper on Chaotic Behavior didn't reach any strong conclusions. The paper on Catastrophe Theory proposes that there is a three-dimensional relationship between the speed, flow and density graphs. There is a lot of work going on in the area of Catastrophe Theory and there were at least three different papers presented in different sessions. There appears to be more work needed in this area. It is something we should follow closely.</p>		

Attendee	Session Title	Comments	Follow-up Name	Comments
Henry, Kim	Session 210	<p>The most interesting presentation in this session was on instant carpooling on the Shirley Highway. Instant carpooling is a phenomenon that occurred on its own.</p> <p>People wait at a carpool stop and drivers pull in and tell the people in line where they are going. The car is then loaded with a total of four people. Each carpool is made up of different people each day. This apparently is starting to catch on in the the San Francisco area.</p> <p>The advantages are that its cheaper (passengers ride free), faster (average passenger wait time is about 2 minutes, which is less than transit headways), no diversion for pick-up of passengers (similar to park and ride lot operation), and decreases public transit cost. The area I was unclear on was whether these instant carpoolers were former transit users or SOV's. If they were former transit users this would result in increased volumes in the HOV lane. If they were former SOV's it would result in less overall congestion and better use of the HOV lane.</p> <p>If you have any questions or need clarification please give me a call.</p>		
Jackson, Newton	Session 207: Weigh-in-Motion	<p>A.T. Papagiannakis gave a presentation on "Accuracy of Weigh-in Motion Scales and Piezoelectric Cables." This paper provided a very good discussion of the effects of specific truck dynamics on piezoelectric WIM performance. Though not very encouraging, it clearly addressed the problem of specific vehicle dynamics on the measurement of vehicle weights in motion, which is not unique to piezoelectric systems.</p>	Gupta, Kris	

Attendee	Session Title	Comments	Follow-up Name	Comments
Jacobson, Les	Session 5: Freeway Operations	<p data-bbox="717 280 1709 367">Five papers were presented during this session. In the first, Ana Gall reported on work being done at McMaster University in Canada to distinguish between incident congestion and recurrent congestion in data received from freeway electronic surveillance systems.</p> <p data-bbox="717 399 1655 537">In the second paper, Fred Hall covered work from McMaster University that was evaluating speed estimates made with single detector data from freeway management systems. The researchers found that the equations generally used to calculate speed from volume and lane occupancy give biased results under very light traffic conditions and when traffic is quite congested.</p> <p data-bbox="717 570 1516 594">I made the third presentation on our Seattle ramp metering system's algorithm.</p> <p data-bbox="717 626 1655 712">The fourth presentation was made by Ray Krammes of Texas A and M and dealt with traffic management strategies for urban reconstruction projects. Most of the information presented reflected current practice in the Seattle area.</p> <p data-bbox="717 745 1677 797">The final presentation, made by Jiangfei Zhang, covered modifications to the FREQ computer model that will allow the model to simulate incident conditions and reconstruction activities.</p>	Jacobson, Les Henry, Kim Everett, Susan	<p data-bbox="2085 272 2416 805">The work at McMaster should be followed to see if an improved incident detection algorithm will result and to see if they provide any insights on traffic flow theory. (I have been in contact with the researchers at McMaster — they have sent me papers to review and we are working to get some data to them collected from the Seattle system.) The FREQ model will be one of the models evaluated in our incident management project to provide tools for WSDOT personnel involved in traffic control and traffic mitigation for construction projects.</p>

Attendee	Session Title	Comments	Follow-up Name	Comments
Jacobson, Les	Committee A3A09: Freeway Operations	<p>The committee met on Monday afternoon and Tuesday afternoon. The first meeting was taken up by status reports of the various systems throughout North America and by a video of the INFORM (or IMIS) system on Long Island. Some of the points of interest included the automatic toll collection system being tested by the Port Authority of New York and New Jersey — the automatic vehicle identification system is 99.5 percent accurate, and they are planning to implement the system and expand it to other toll facilities. In Houston, they have recently raised the carpool definition on the Katy transitway from 2+ to 3+ for an hour and 15 minute period in each peak — they have not experienced the anticipated outcry against this change. Work done at Texas A and M shows that removing shoulders and narrowing lanes to increase the number of lanes under congested conditions decreases accident rates. (The left shoulder can be removed for long lengths, but agencies must be more careful with the right shoulder — if no shoulder is on either side for long stretches, the accident rate is abnormally high.) The second meeting of the committee covered committee business, subcommittee and committee liaison reports, and an informal paper presentation, titled "Single Station Algorithm for Automatic Detection of Freeway Incidents."</p> <p>The last portion of the second meeting dealt with research statements to be recommended to TRB. Some of the areas of interest are developing on-line algorithms for route diversion; developing new incident detection algorithms using new detection techniques such as video image scanning (rather than loop detectors); and using cable TV, telephone, and computers to deliver traffic information (similar to our research on improving motorist information systems).</p>	Henry, Kim Jacobson, Les	Follow national projects for application in WSDOT. Follow McMaster work on incident detection.
Jacobson, Les	Session 60: Applications and Research in Advanced Vehicle and Highway Technology	<p>There were four presentations in this session, but I missed the first. The second presentation by Kan Chen described the research planning study being conducted at the University of Michigan to develop a program in intelligent vehicle highway systems.</p> <p>The third presentation by Ginger Gherardi was on the SMART Street project in Los Angeles. The plan is to link the freeway and arterial control systems to balance flow between the arterials and the freeway in the Santa Monica Freeway corridor.</p> <p>The last presentation by Peter Davies was on the radio data system (RDS). This system allows digital codes to be silently broadcast over existing FM transmissions. When the driver wants a traffic report, he pushes a button on the radio and the digital codes stored are interpreted and synthesized voice messages are played over the radio's speaker system.</p>		No action required. We are somewhat involved in the advanced technology efforts through TRAC's involvement in the NCHRP project evaluating advanced technologies and through WSDOT coordination with California and FHWA in the Advanced Driver Information System committee.

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Attendee	Session Title	Comments	Follow-up Name	Comments
Jacobson, Les	Session 85: Advanced Vehicle and Highway Technology	<p>The session was broken into three parts. The first consisted of presentation of a panel on U.S. technical programs on advanced highway technology. The second part was a presentation on overseas programs, and the third contained two presentations on U.S. views. Three of these presentations were of particular interest.</p> <p>Dave Willis of the American Trucking Association Foundation presented views of the trucking industry. He noted that there are several views within the trucking industry — commercial fleets versus individual trucker, local versus long haul, less than a truckload versus truckload delivery, management versus drivers, fleets versus owner operator. The impediments are the cost of technology (up-front and recurring), conservatism within the industry, and human factors (such as how to present information and location of equipment).</p> <p>Ken Russam of the TRRL presented the European efforts. In 1986, the European Parliament identified road technology as an area for advanced research. This led to PROMETHEUS, which is a public and private cooperative effort to look at advanced technology in vehicles, network communication, and roadway infrastructure. The overlap in these programs led to DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe). The goals of DRIVE are to improve road safety, increase efficiency, increase network capacity, reduce fuel consumption, and reduce environmental impacts.</p> <p>Lyle Saxton presented the FHWA perspective. They are very concerned and committed to advanced technology as a way to improve safety and reduce congestion. Their activities currently are in research and development (PATHFINDER, SMART, traffic simulation modeling, and advanced traffic control strategies), national coordination (through Mobility 2000 and the Advanced Driver Information Systems working group), and a Congressional study to report on intelligent vehicle highway systems.</p>		None required. These issues are currently being closely followed within WSDOT.
Jacobson, Les	Session 126: Traffic Flow Theory	<p>Robert Gilchrist presented work being done at McMaster University that looks at three-dimensional views of speed, flow, and density (lane occupancy) to try to better understand and describe traffic flow.</p> <p>John Disbro of the New York State DOT presented a paper on traffic flow theory and chaotic behavior. (Chaotic behavior is a mathematical model.) The conclusions of the study are that car-following equations exhibit chaotic behavior and, therefore, chaos theory may lead to a better description of traffic flow than current theory.</p>	Jacobson, Les	Follow developments in traffic flow theory to see how they affect traffic control and incident detection algorithms.

Attendee	Session Title	Comments	Follow-up Name	Comments
Jacobson, Les	Committee A3A18: Traffic Signal System	<p>The committee meeting was held in two parts on Wednesday morning and afternoon.</p> <p>The first part of the meeting covered committee business and short discussions of several technical matters, including the Mobility 2000 initiative. Topics for sessions at the 1990 Annual Meeting were discussed. The two major topics of interest were integrated corridor traffic control and issues surrounding traffic control and route guidance — how the two fit together. Ken Russam of TRRL discussed some of the things that are taking place in the U.K. Their MOVA program for isolated intersection control (similar to FHWA's OPAC system) has been implemented at 20 sites. MOVA anticipates queues and controls signals accordingly.</p> <p>The afternoon portion of the meeting consisted of informal presentations on a variety of topics. Jeff Lindley of the FHWA described the RFP that recently went out on developing arterial/freeway integrated control.</p> <p>Phil Tarnoff of Farradyne presented an evaluation of the OPAC system. OPAC is currently configured as an alternative to isolated, actuated control designed to minimize intersection delay and make efficient use of intersection capacity. Two test sites were selected for implementation of two phase operation, and the enhanced version was tested at an eight-phase signal in Tucson. The conclusions of the evaluation are that OPAC works well for isolated intersection control, and it is ready to move out of the research phase and into production. There are three avenues the program can take: (1) remain an isolated control strategy only, (2) imbed OPAC into system logic for critical intersection control, or (3) develop and test the logic for arterial or network control.</p>	Jacobson, Les, to follow OPAC results and incorporate in current arterial control research project.	We should keep the committee informed of what we are doing in integrated control and we should follow the progress of the OPAC system to determine if it is appropriate for use in Washington state. I believe it would be beneficial to get a signal operations or design person from WSDOT on this committee next time committee membership changes. (I understand there is considerable interest in this committee nationwide, however.)

Attendee	Session Title	Comments	Follow-up Name	Comments
Jacobson, Les	Session 210: Ridesharing	<p>This session was divided into two parts. The first part dealt with the question, "Do HOV facilities change commuter behavior?" The second part dealt with the question, "Have Transportation Demand Management strategies produced results?"</p> <p>Three papers were presented in the first part of the session. Larry Wesemann of the Orange County Transit District presented results of travel surveys they conducted before and after implementation of HOV lanes on the Costa Mesa Freeway in Orange County. The survey was conducted by collecting license numbers using high resolution video.</p> <p>Arlee Reno of the Urban Institute presented the second paper on the evaluation of instant carpooling in Fairfax County, Virginia. Instant carpooling is when drivers and passengers form a carpool in a designated location for a given trip. This has been a successful program that has formalized an informal program started by commuters themselves.</p> <p>The last presentation in the first part of the session was made by John Powers of the New Jersey DOT and dealt with the first year of operation of the bus-carpool lane of the George Washington Bridge. The lane is one mile long and provides approximately a five-minute travel time advantage.</p> <p>The first presentation in the second part of the session was given by Kathy Snow of Seattle Metro and presented Metro's guaranteed ride home project. The program provides HOV users with a subsidized ride home in emergency situations.</p> <p>Philip Winters of Ridefinders presented the next paper on a Ridefinders (the Richmond, Virginia ridematch service) program to provide parking information for downtown Richmond. The idea was to address the parking information problem and to get Ridefinders service information to people who normally drive alone to work.</p> <p>The third presentation by Don Torluemke of Ekistic Mobility Consultants covered the success of a corporate run vanpool program at Aerospace Corporation.</p> <p>The final presentation of the session was made by Frederick Wegman of the University of Tennessee on the cost effectiveness of private employer ridesharing programs. The conclusion was that the programs are definitely cost effective, even though it is difficult to quantify, and that firms perceive the programs to be cost effective. It is less costly to provide ridesharing services than to provide the cost of parking.</p>		None required. Our HOV Compliance Monitoring project is investigating the use of high resolution video to monitor HOV lane violations.

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 59: Managing Congestion through Pricing	<p>Peter Partington — Several road pricing schemes — supplementary license for certain area. Bergen — 1986 — tolls to get into downtown. Bergen collected \$8M 1st year                      Hong Kong — 1985 Electronic detection of vehicles entering downtown (AVI). Not implemented generally because of economic downturn.</p> <p>Frida Johansen — Brief description of several systems . . . i.e., Dulles Toll Road.</p> <p>Doug Lee — (see paper) Proper pricing of roads would indicate most roads wouldn't support expansion. Present pricing way below cost. Should be less highways, fewer dollars spent on them, etc . . .</p> <p>Daniel Kaplan — Why isn't pricing used? (1) Users don't want it; (2) Politics; (3) regulatory agencies not in favor. (Speaking of aviation.) Present method of financing should be changed (ticket taxes and general aviation fuel tax). Users should be charged the cost they impose on the system. FAA should be chief regulator, not local airports.</p> <p>Dave Davis — (Massport) — Program for Airport Capacity and Efficiency is working; fewer flights — more passengers. Feds say to stop! Courts say it's OK. Feds inflexible . . . don't recognize good management. Definition of capacity should be people and goods, not airplanes. Fixed costs are per airplane; not dependent on size. Smaller planes are being subsidized . . . not in Boston now.</p> <p>Aab Rule — (Netherlands) — (see paper)</p> <p>Ron Kirby — (D.C.) Mentioned standard means---HOV, carpools, vanpools, full-priced parking. (Growth rates are happening in excess of 10% per year.) Any new policy can't make any group worse off. Tolls are acceptable to provide new capacity (Dulles Toll Road). No tolls on Interstate — complicates the problem.</p>	Clemmen, James L. Toohey, James P. Hamilton, Bill	

Attendee	Session Title	Comments	Follow-up Name	Comments
		<p>Jim Gonzel — (California) Their plan is to build what they can; manage it as well as they can; manage land use better---maybe peak period pricing. Developer fees now add \$15-30,000 to the price of a house. Hard to charge proper fee for parking --- LA County has free or cheap parking for employees.</p> <p>California proposing 5 to 10 cents gas tax plus indexing.</p> <p>Local sales tax going great guns.</p> <p>Emphasis is on <u>control</u>, not pricing.</p> <p>Q. — Why not finance insurance from road pricing?</p> <p>Q. — Many other questions---mostly about airports.</p> <p>Q. — Marginal costs during gridlock are very large---revenue could be tremendous.</p>		

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 85: Advanced Vehicle Technology	<p>Dan Brand — These systems must be market driven — not forced.</p> <p>Adib Kanafan: PATH in California--looking at propulsion system as well as automated vehicles, guideways, etc. They have a test track for non-contact electric propulsion. Lateral guidance--could reduce lane widths. Longitudinal control and robotics also under study.</p> <p>Kan Chen — IVHS — 20 group sponsor — just putting agenda together (U. of Michigan)</p> <p>Joe Sussman (MIT) — Heading toward demonstration project in mid-90s — apparently mostly talk right now.</p> <p>Dave Willis (ATA) IVHS — Who wants it or needs it? Listing of advantages and disadvantages to trucking fleets . . . generally good, but some apprehension.</p> <p>Bill Spreitzer — (GM) — "Pathfinder" — in Santa Monica. Several other external programs, including Europe and Japan. Also internal research--electronics, etc. More listings of "what's needed."</p> <p>Sadler Bridojos (Texas A and M) — 1 year program funded at \$1/4M. Looks like "state-of-the-art" search, and signal optimization. Autonomous vehicle study includes collision avoidance systems . . . not really started yet. Next phase . . . advanced traffic management, driver info systems, etc.</p> <p>Ken Russam (U.K.) — Talked about Prometheus, DRIVE (Dedicated Road Infrastructure for Vehicle Safety in Europe) (120 million ECU over 36 months). Hope to get safety, efficiency, capacity, less energy consumption, and fewer emissions. Establish standards and guidelines for all to follow. Autoguide---another scheme for guiding car to present destination. Similar project in Germany.</p>	Toohey, James P. Stemmer, Art	

Attendee	Session Title	Comments	Follow-up Name	Comments
		<p>Lyle Saxton — (FHWA) — Previous research in advanced traffic management systems, etc. Current — continuing R and D; National Coordination, and a Congressional study. Pathfinder, formal testing in 1990, in-vehicle displays, assessment of benefits, control strategies. Working on "Mobility 2000" and ADIS.</p> <p>Frank Francois (AASHTO) — Outlined six key issues; consensus transp. program "The Bottom Line," especially sections C and E. Mentioned WASHTO leadership. Special Committee on Transportation Systems Operation about to begin. Eight more issues listed (i.e. public/private partnership).</p>		
Schuster, Bob	Session 144: High Occupancy Vehicle Facilities	<p>Frank Cechini — FHWA Calif. — Regular lanes should <u>not</u> be adversely affected. Time savings should be at least 1 min. per mile; 5-10 min. per trip. HOV lane <u>should</u> have adequate shoulder; if not, should have enforcement areas. Concurrent flow lane should have 2-4' buffer (4' preferred). Direct intermediate access preferable (its own ramps). <u>Safety should not be compromised.</u> Video enforcement has great potential. Starting with 2+ helps public perception of lane use. Frank says allowing mixed flow in off-peak does not increase violations and reduces accidents; admits more study and experimentation is needed.</p> <p>Katherine Turnbull — Minneapolis — Report on 3rd National Conferenced. Need to continue to share info--newsletter in the works. 1989 Conference — Wash. D.C. late fall; 1990 in Seattle.</p> <p>Sharon Greene — Calif. — Extensive data collected and evaluated on R+ 55 project. Went through it all . . . available if anyone wants it. Enforcement pockets on the left don't work. Some flak during Q. and A. from Roger, whose firm did the survey.</p> <p>Chuck Fuhs — Texas — Slides of various projects across the country. Much praise of Seattle, but no mention of WSDOT.</p> <p>Dennis Christiansen — Texas — Katy transitway went to 3+ from 6:45 to 8:15 A.M. Large reduction in vehicles, moderate reduction in people; increase in hours saved.</p>	Slemmer, Art Bockstruck, Ron	

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 199: Heavy Vehicle Management Program and Demonstration Project	<p>Bob Bothman — Oregon — H.E.L.P. program organization, goals, etc.                      Consultant — Chris Hill — Described technical aspects — on-board transponder, WIM, AVC, SRS, AVI; off-shelf AVI systems not reliable.</p> <p>Peter Davies — developed specifications to use best characteristics of existing systems to get 100% reliability. 4 types of transponder.</p> <p>Virgil Umthun — Trucker — Short history of his family company — 400 trucks. Used "Argo Clocks" to record mileage, max RPMs, etc. Short rundown on his part of H.E.L.P. Personally thinks this "one step" would be a great replacement for a truck cab full of paper.</p> <p>John Van Borkel — Caltrans — Explains relationship to H.E.L.P. and Crescent Project. Describes goals. "Crescent" demo will be 33 stations from Washington to Texas. Also parallel study in Canada. Demo should design around mid-'90--1 year + 6 mo. evaluation. 5,000 vehicles. We need to get AVI equipment (and WIM) installed. 6 sites in Washington. Looks like there will be need to be a link to our data and D.O.L. and WSP.</p>	Ingham, Dennis	

Attendee	Session Title	Comments	Follow-up Name	Comments
Schuster, Bob	Session 207: Weigh-in Motion Equipment and Activities	<p>Curt McCullough — Two-point classification system. Worked up classification system based on distances between axles, and speed. Program only developed so far---no prototype actually installed and used, except in China, by Dr. Huang.</p> <p>Tom Papagiannakis — Accuracy of WIM scales and piezoelectric cables. Says comparing dynamic load to static weight is apples vs. oranges. Could be getting dynamic load at any of these points. At any one location, could always be weighing 10% low or high. Says dynamic load is what does the damage; should be the one measured. Piezos did this as well as WIM scales.</p> <p>Larry Hart — Measurement standards — ASTM subcommittee 17.42--traffic data: weigh classification, speed, etc. They're working on a standard for WIM systems. Can get it from ASTM. Arizona DOT developed a performance spec as part of H.E.L.P. NCHRP has projects 3-34 and 3-36; also 3-39 (similar to ASTM work). FHWA too, has a couple of reports. WIM enforcement conference coming up Summer 1990.</p> <p>Dick Stier — October WIM Conf. report.</p> <p>Nick Ayland and Neil Emmott — Castle Rock Consultants — Weight enforcement screening in U.K. and screening for enforcement of "no-trucks" restrictions by Piezo's and (in 2nd one) cameras.</p>	Ingham, Dennis Toohey, James P.	

## 68th Annual TRB Meeting

Attendee	Session Title	Comments	Follow-up Name	Comments
Smelser, Arthur T.	Session 210: Ridesharing	<p>Several people reported with a variety of information</p> <ul style="list-style-type: none"> <li>Mr. Larry Wiesmann reported on the experience with a new HOV in Orange County, California, opened in 1985. A license plate survey was done on the two-per-car lane. Occupancy overall increased from 1.21/vehicle to 1.34/vehicle. Growth in carpools has doubled.</li> <li>Mr. John Powers reported on the first year of operation of a new bus-carpool lane on the George Washington Bridge. Carpools increased on the route from 430/day to over 1500/day.</li> <li>Ms. Kathy Snow of METRO-Seattle reported on the Guaranteed Ride Home program. While less than 4% of the allotted miles were used, a survey showed that its availability was important in the decision to rideshare for first time users.</li> </ul>	Lenzi, Jerry	
Ulberg, Cy	Committee A1C04(1) Activity Analysis and Travel Patterns Ryuichi Kitamura University of California, Davis	"Activity analysis" refers to an approach to understanding travel behavior and is not a model in itself. It concentrates on the activities that travelers are going between rather than on the trips themselves. It emphasizes multiple stop trips, household travel planning and patterns of trip-making. One of the problems with the whole field that was discussed in the meeting is that there are no concrete models to refer to and very little in the way of practical application at the moment. Even though, the "activity analysis" perspective has influenced all travel modelling, there is some frustration that there is little concrete to organize around. The subcommittee may cease to function in its current form.	Ulberg, Cy	
Ulberg, Cy	Session 59: Road Pricing Managing Congestion through Pricing	Given the advances in technology, and the current ability to assess tolls without having vehicles stop, it is now possible to consider road pricing schemes that can both manage traffic and generate revenue. The papers in this session emphasized the economic efficiency of road pricing and the newly-found ability to apply it. One paper discussed Holland's adoption of road pricing as a policy last fall. The technology to implement it has not been determined.	Ulberg, Cy	

Attendee	Session Title	Comments	Follow-up Name	Comments
Ulberg, Cy	Committee A1E06: Multiple Mode Marketing Public Transportation Marketing and Fare Policy Bill Loudon JHK Associates, San Francisco	One of the main substantive topics at the committee meeting was the marketing of multiple modes. Traditionally, transit agencies have been involved with marketing bus service. However, there is more and more involvement in the marketing of vanpools, carpools and other ridesharing options. In addition, transit agencies have taken proactive stances on land use and pricing policies that affect ridesharing. This committee will pursue this subject more vigorously and promote research and publications in this area.	Ulberg, Cy	
Ulberg, Cy	Session 138: State DOT Investments in Public Transportation Marketing Marketing Public Transportation Peter Everett University of Pennsylvania	A survey of state DOTs was conducted to determine their current and desired involvement in public transportation marketing. The average DOT invests \$50,000 per year in transit marketing. Most of the state assistance is in consumer information aids and there was a desire to do more in all areas. However, the study concluded that the state's role should be confined to services that can be provided more efficiently through economies of scale, but that marketing efforts such as advertising and pricing incentives should be left to individual transit agencies.	Ulberg, Cy	
Ulberg, Cy	Session 138: Geographically Targeted Marketing for Transit Marketing Public Transportation Carol Pedersen Tri-Met Portland	A targeted marketing effort was used in Portland to promote use of feeder bus routes serving the new light rail system. A direct mail campaign was used to contact about 16,000 people in one neighborhood. A free pass was offered. Ridership on the feeder bus routes did not increase significantly, but there is some evidence that people used the pass to try out the light rail. The long range effects on ridership were not measured. This paper was interesting because it is unusual to get research evidence that marketing campaigns don't work very well.	Ulberg, Cy	

Attendee	Session Title	Comments	Follow-up Name	Comments
Ulberg, Cy	Session 138: Deep Discount Fares to Promote Ridership and Raise Revenue. Marketing Public Transportation Richard Orem Orem Associates New York City	Several places have found that combining major discounts for transit use in conjunction with the use of prepaid tickets has resulted in both an increase in ridership and in revenue. These experiments are based on the observation that most transit users are sporadic users and that a concentration on that market can have great payoffs with only slight increases in use by the sporadic riders. By offering the discount for prepaid tickets, people who don't use transit very often are likely to use it more and the money lost through the discount can often be made up with the extra riders. This type of program has been implemented usually when fares, in general, are going up. The "discount" is actually an opportunity to pay the same rate as before the fare increase.	Ulberg, Cy	
Ulberg, Cy	Session 138: Computerized Rider Information System Marketing Public Transportation Deborah Dagang Cambridge Systematics Berkeley	The introduction of a computerize rider information system in the Albany transit system was evaluated. The system allowed potential riders to dial a number corresponding to a certain route at a certain bus stop and obtain information, generated automatically, on the arrival times of the next three buses. The arrival times can be adjusted manually when delays occur. The paper showed that such a system can be installed relatively cheaply and will be used. However, there wasn't enough information to evaluate the cost compared to human information operators or to assess the effect on ridership.	Ulberg, Cy	
Ulberg, Cy	Session 144: Increasing Occupancy Requirement in HOV Lanes High-Occupancy Vehicle Facilities Dennis Christiansen Texas A and M	The Katy Transitway formerly had a 2+ occupancy requirement. However, because of congestion on the facility, its usefulness was minimal. The definition was raised to 3+ last fall. This presentation discussed the results. There was significant improvement in the operating characteristics, as expected. Surprisingly, there was little, if any, negative reaction in the press or by the public. The key seemed to be everybody's recognition that the 2+ definitions wasn't working.	Ulberg, Cy	
Ulberg, Cy	Session 210: Ridesharing "Instant carpooling" Arlee Reno Urban Institute Washington, DC	In Springfield, a phenomenon that some call "casual carpooling" has emerged to take advantage of the fast service on Shirley Highway, which has a 4+ occupancy requirement. The time savings is substantial, so motorists are motivated to find people to fill their car. Reno prefers to call the phenomenon "instant" because it is not casual at all. In Springfield it is very organized and orderly. Some 3000 people participate. The keys to success are the substantial time savings and the 4+ definition. The latter is important because there is less psychological blocking involved in getting in a car with 3 strangers than with one.	Ulberg, Cy	



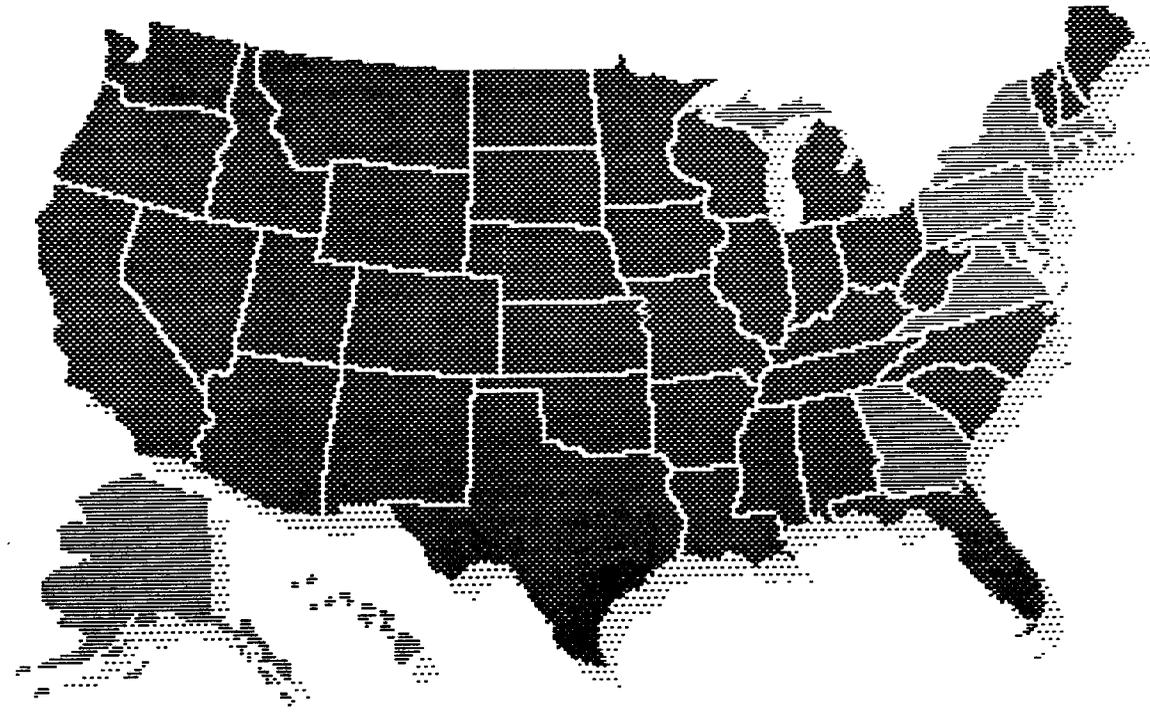
# **Impact of 65 mph Limit on Rural Interstate Fatalities**

**David Skinner**

**Transportation Systems Center**

**U.S. Department of Transportation**

**Research and Special Programs Administration**



## **SUMMARY...BASED on ALL 1987 DATA**

- **18% average increase in Rural Interstate fatalities for 1987 after 38 states adopted 65 mph during that year.**
- **227 lives (point estimate).**
- **Changes in fatalities were not constant:**
  - **Some states had no increases;**
  - **Some states had increases as high as 40%.**
- **More work needs to be done on reasons for differential effects.**

## **PERSPECTIVES**

- **Macro analysis of 38 states to determine overall fatality effect.**
- **Micro analysis of looking specifically at one or a few states.**
- **Costs and benefits of each type.**

## **METHODS**

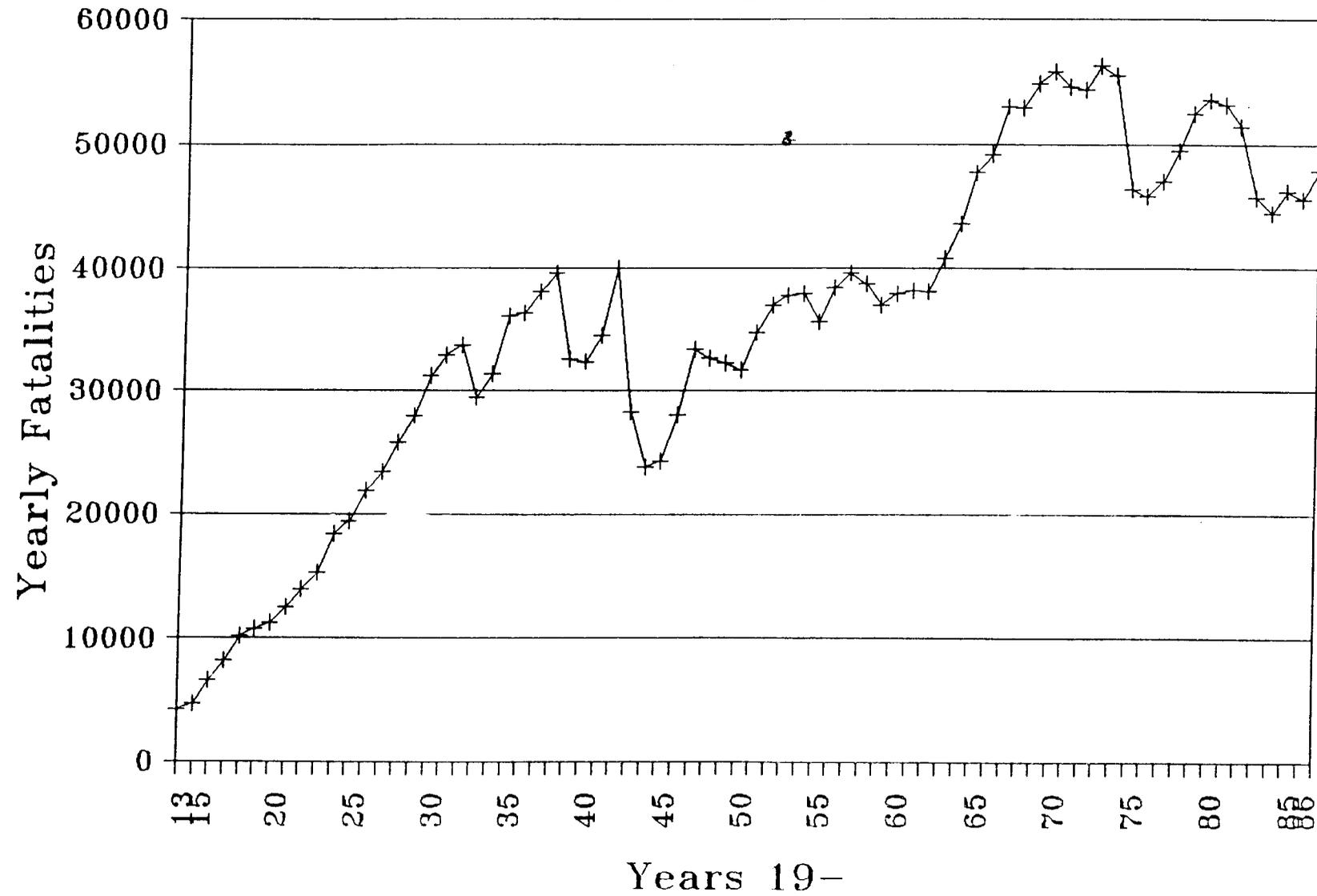
- **Fatalities change for many reasons over time.**
- **Need a basis of comparison.**
- **Would like to have explicit determinants of Rural Interstate fatalities consistently measured over time:**
  - **specific location of fatal accidents**
  - **travel mileage**
  - **speed distribution**
  - **other measures of risk distribution**
- **Have to find another basis of control:**
  - **companion series method**
    - **theoretical and statistical basis**

## **COMPANION SERIES**

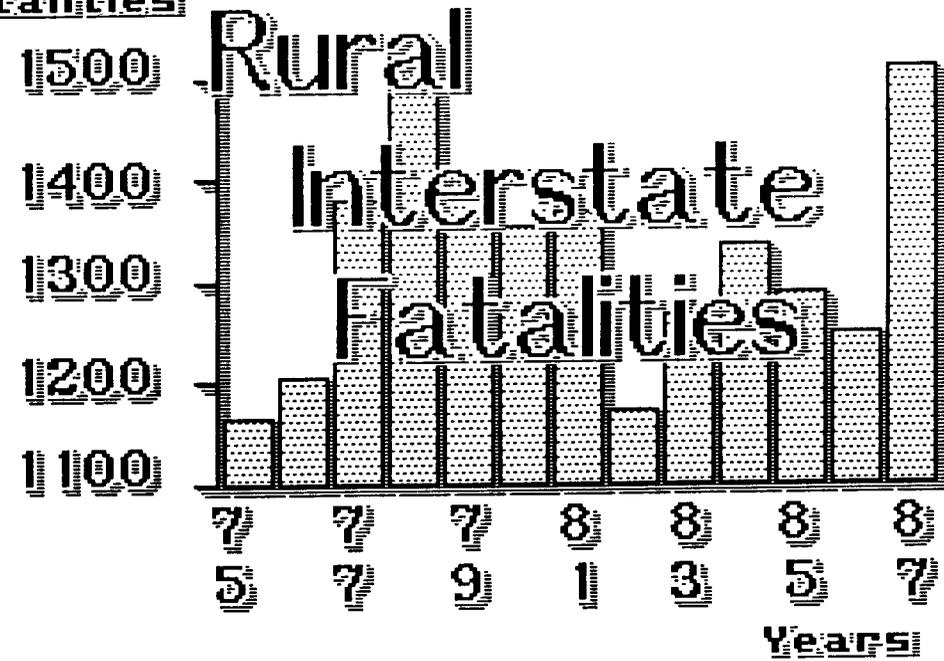
- **Statistically tested companion series.**
  - **In states with law changes:**
    - **All other fatalities**
    - **Urban Interstate fatalities**
    - **Rural Interstate fatalities (3 months before implementation)**
    - **Rural Interstate travel**
  - **In states without law changes:**
    - **Rural Interstate fatalities**
  
- **Best companion series:**
  - **All other fatalities**

# Highway Fatalities

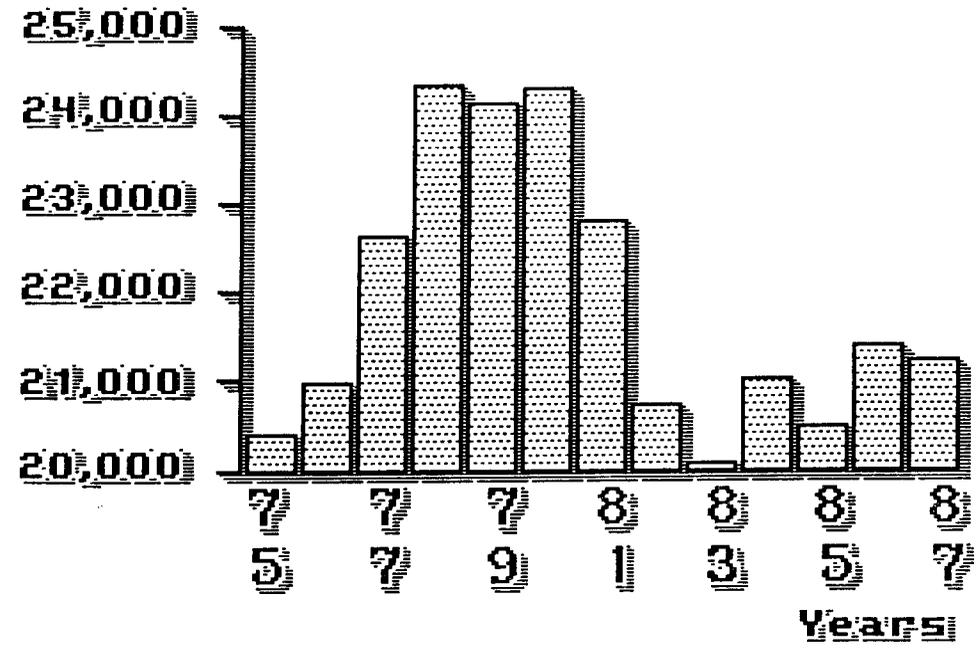
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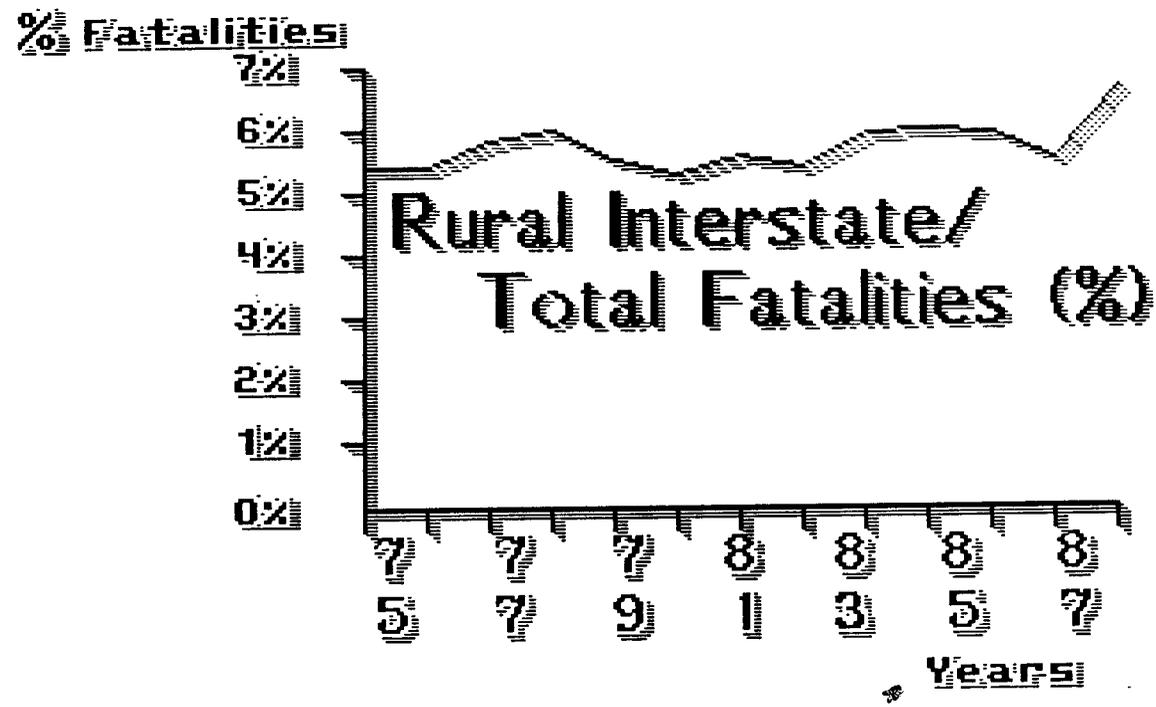


**Fatalities**



**Fatalities:**





## **SUMMARY...BASED on ALL 1987 DATA**

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Fatalities in States that Increased Speed Limits during 1987  
 -- Days Under the Higher Speed Limit

<u>Year</u>	<u>Rural</u>			<u>Percent on Rural Interstates</u>
	<u>Interstates</u>	<u>Other Roads</u>	<u>All Roads</u>	
1975	1,163	20,375	21,538	5.4%
1976	1,204	20,963	22,167	5.4%
1977	1,380	22,613	23,993	5.8%
1978	1,539	24,314	25,853	6.0%
1979	1,403	24,108	25,511	5.5%
1980	1,353	24,289	25,642	5.3%
1981	1,368	22,971	24,339	5.6%
1982	1,173	20,709	21,882	5.4%
1983	1,266	20,076	21,342	5.9%
1984	1,336	21,002	22,338	6.0%
1985	1,287	20,458	21,745	5.9%
1986	1,247	21,366	22,613	5.5%
1987	1,512	21,231	22,743	6.6%

Absolute and Percentage Changes  
 in Rural Interstate Travel and Fatalities  
 in 38 States that Raised the Speed Limit

<u>Year</u>	<u>Travel All Year</u>		<u>Deaths After 65</u>	
	<u>Millions</u>	<u>Change</u>	<u>Number</u>	<u>Change</u>
1975	88,299	-	1,163	-
1976	93,863	6.3 %	1,204	3.5 %
1977	100,722	7.3 %	1,380	14.6 %
1978	108,981	8.2 %	1,539	11.5 %
1979	106,892	-1.9 %	1,403	-8.8 %
1980	107,442	0.5 %	1,353	-3.6 %
1981	111,089	3.4 %	1,368	1.1 %
1982	113,736	2.4 %	1,173	-14.3 %
1983	116,196	2.2 %	1,266	7.9 %
1984	119,336	2.7 %	1,336	5.5 %
1985	123,265	3.3 %	1,287	-3.7 %
1986	127,489	3.4 %	1,247	-3.1 %
1987	136,923	7.4 %	1,512	21.3 %