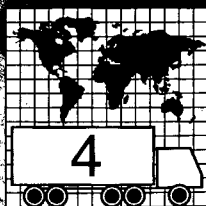
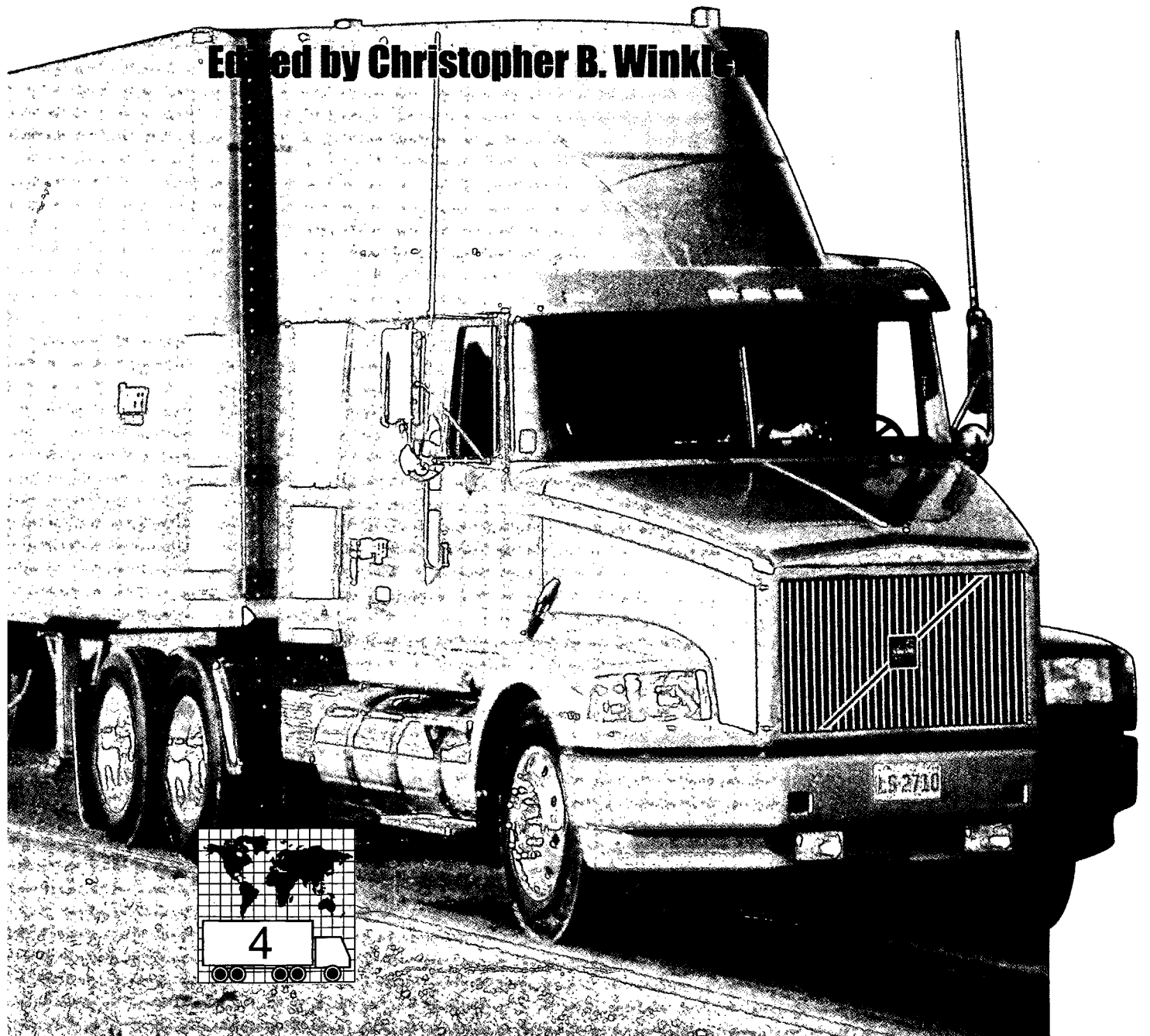


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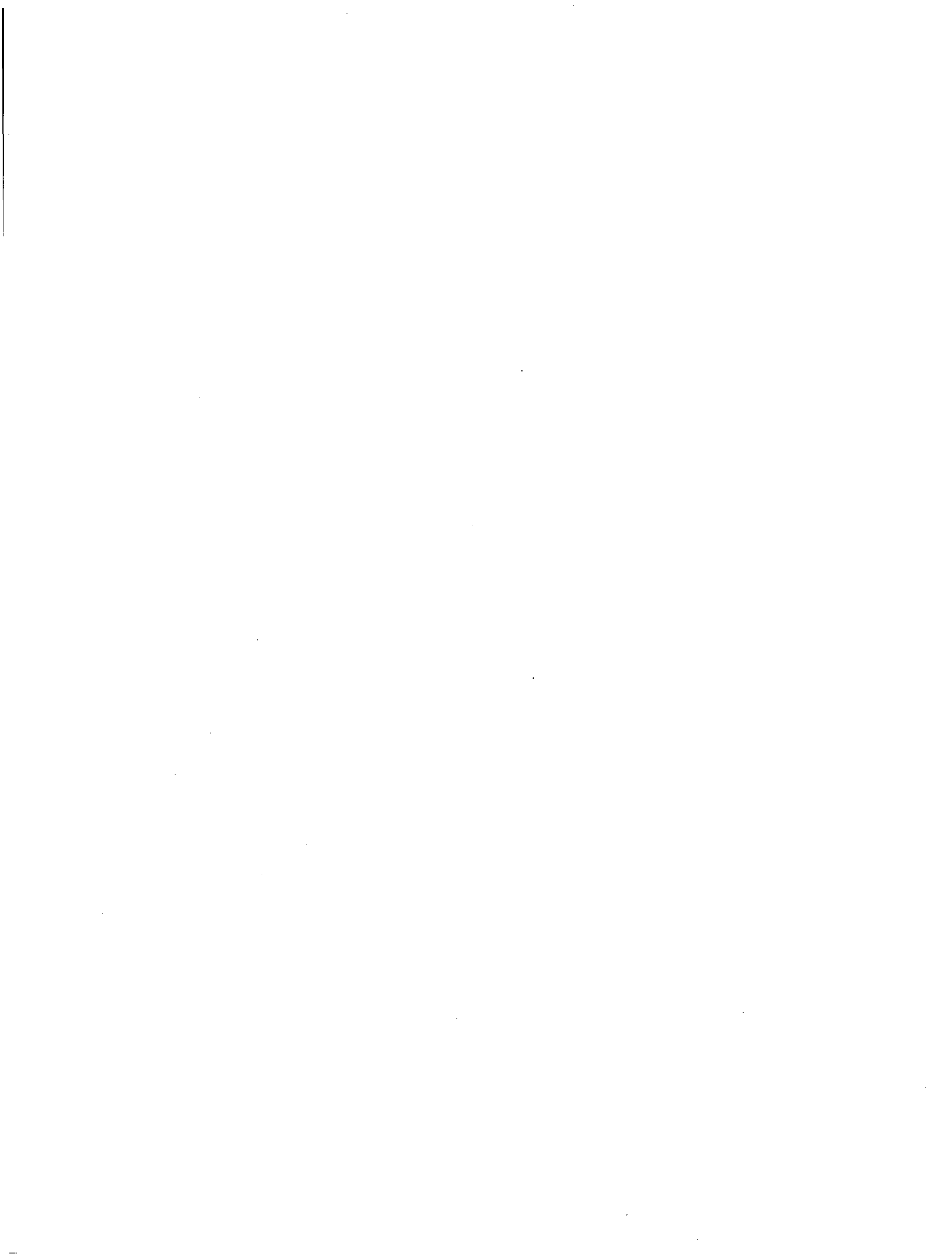
Proceedings of the
Fourth International Symposium on
Heavy Vehicle Weights and Dimensions

Edited by Christopher B. Winkle



Road Transport Technology—4

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Proceedings of the Fourth International Symposium on Heavy
Vehicle Weights and Dimensions

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Institute in cooperation with the International Forum for Road
Transport Technology

Ann Arbor, USA, June 25–29, 1995

Edited by Christopher B. Winkler

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Preface

Christopher B. Winkler

University of Michigan Transportation Research Institute, USA

The Fourth International Symposium on Heavy Vehicle Weights and Dimensions took place at the University of Michigan in Ann Arbor on June 25 through June 29, 1995. The symposium was a function of the International Forum for Road Transport Technology.

The members of the technical committee of the symposium were C.B. Winkler (Chairman, USA), J. Aurell (Sweden), R. Cantieni (Switzerland), D. Cebon (UK), J. de Pont (New Zealand), M. Huhtala (Finland), B. Lord (USA), C.G.B. Mitchell (UK), R.A. Pearson (Australia), J. Preston-Thomas (Canada), L. Strawhorn (USA), P.F. Sweatman (Australia), N.C. Ware (USA), and J. Woodrooffe (Canada).

One hundred and eleven individuals attended as delegates to the symposium. They came to Ann Arbor from twenty-one countries: forty-three from the United States; twenty-one from Canada; nine from Australia; five each from New Zealand and Sweden; four from the United Kingdom; three each from Brazil, France, and the Netherlands; two each from Norway, Switzerland, and Taiwan ROC; and one each from Austria, Bangladesh, Belgium, Finland, Germany, Hungary, Korea, South Africa, and Venezuela.

The symposium was opened by Robert Welke, Chief Engineer/Deputy Director of the Michigan Department of Transportation (USA). Mr. Welke presided over Sunday's opening plenary session, which included four additional keynote speakers: George Reagle, Associate Administrator for Motor Carriers, Federal Highway Administration, U.S. Department of Transportation (USA); Burkhard Horn, Head of the Road Transport Research Programme, OECD (United Nations); John Hurlstone, Chairman of the National Road Transport Commission (Australia); and Richard Turner, Director of the Freight Transport Association (UK). Over the following four days, an additional sixty-seven formal presentations were given in a mixture of plenary and parallel technical sessions and panel discussions. The symposium closed with two endnote presentations given by Robert Ervin, Head of the Engineering Research Division, University of Michigan Transportation Research Institute (USA) and Byron Lord, Chief of Engineering Application Division, Federal Highway Administration, U.S. Department of Transportation (USA).

An essential purpose of this series of symposia is to promote the intermixing of various elements of the road transport community. On one hand, these meetings seek to bring together members of the vehicle and infrastructure

technical communities, and on the other hand they are intended to attract both policy makers and technical people. To enhance the interchange between these several groups, the presentations of the fourth symposium generally were *not* organized by topic. Rather, papers covering several topics were typically included in each individual session.

To enhance the utility of this document, however, the written papers have been reorganized by topic and, therefore, are not presented according to session as is traditional in technical proceedings. The sixty-eight papers herein are divided into three major topic areas: policy, regulation and economics; infrastructure technology; and vehicle technology. Each of these areas is subdivided into a number of more specific topics.

Many people and organizations deserve our sincere thanks and appreciation for helping make the symposium the success that it was. The chairman and the members of the technical committee wish to especially acknowledge the contributions of the following:

- Sponsoring organizations: Federal Highway Administration United States Department of Transportation; Great Lakes Center for Truck and Transit Research; University of Michigan Transportation Research Institute.
- Major sponsor: Volvo GM Heavy Truck Corporation.
- Sponsors: American Trucking Associations, ATA Foundation, Australian Road Transport Suppliers Association, Eaton Corporation, Independent Trailer and Repair, Midland-Grau Heavy Duty Systems, National Road Transport Commission of Australia, Navistar International Transportation Corporation, Road User Research, Rockwell WABCO Vehicle Control Systems, Shennen Publishing and Publicity Company.
- Session chairmen: Rod Addis, John Aurell, John Billing, Reto Cantieni, David Cebon, John de Pont, John Edgar, Bob Ervin, Paul Fancher, Tom Gillespie, Matti Huhtala, Bill Kenis, Kit Mitchell, Jon Preston-Thomas, Peter Sweatman, Nate Ware, and John Woodrooffe.
- Chrysler Center staff, especially Edith Baise, Terry Bennett, Renée Heath, Annette Petrusso, Jane Poling, and Nancy Wrosch.
- UMTRI staff, especially Ardith Bates, Scott Bogard, Annise Johnson, John Koch, Ben Powell, Kathy Richards, Bob Sweet, Jim Thomson, and Pat Waller.
- Special thanks to Peter Sweatman, Kit Mitchell, and Nate Ware.



Table Of Contents

KEYNOTE PRESENTATIONS

Truck Size And Weight Policy—Current Activity Of The FHWA	1
<i>G.L. Reagle</i>	
International Co-Operation On Infrastructure And Heavy Freight Vehicles Within OECD.....	3
<i>B. Horn</i>	
Australia's Approach To Uniform Road Transport Law.....	9
<i>J. Hurlstone</i>	
The Operators' View Of Emerging Size And Weight Policy In Europe	15
<i>R.K. Turner</i>	

POLICY, REGULATION, AND ECONOMICS

Road Versus Vehicle Costs

Efficiency Characteristics Of Tractor-Semitrailers	23
<i>E.S.K. Fekpe, J.H.F. Woodrooffe, and P.F. Sweatman</i>	
Relationship Between Road Track Cost And Heavy Vehicle Fuel Consumption	31
<i>J.I. Ghojel and H.C. Watson</i>	

Assessing Road Damage And Costs

Effects Of Overloaded Heavy Vehicles On Pavement And Bridge Design In Taiwan.....	39
<i>C.J. Chou</i>	
Economic Impacts Of Axle Load Limits And Heavy Vehicle Configurations On The Performance Of Pavements In Brazil.....	47
<i>J.L. Fernandes, Jr., J.A. Widmer, and M.H.A. Sória</i>	
Impacts Of Increased Goods Vehicle Weight Limits: A European Case Study.....	55
<i>B.A. Frith, C.G.B. Mitchell, and W.H. Newton</i>	
Estimating Australia's Heavy Vehicle Road Wear Cost Responsibilities (Load Related Road Wear).....	67
<i>T.C. Martin</i>	
Assessing The Relative Road Damaging Potential Of HGVs	75
<i>T.E.C. Potter, D. Cebon, and D.J. Cole</i>	

Economics Of Regulation In North America

Subsidies And External Costs In U.S. Surface Freight Transportation	83
<i>J.R. Morris</i>	
The Economic Effects Of The U.S. 1991 Size And Weight Freeze: Case Studies.....	93
<i>S.D. Nichols</i>	

Implementing Size And Weight Regulations

Implementation Of Vehicle Weight And Dimension Regulations.....	107
<i>J.R. Billing</i>	
Regulating Heavy Vehicle Safety In New Zealand Using Performance Standards.....	115
<i>J. Edgar</i>	
Vehicle Size And Weight Limits—Attempts Towards Legislative Harmonisation Within The European 121Union	121
<i>R. Missen</i>	
Investigation Into The Feasibility Of Heavy Transport Routes In New Zealand	125
<i>L. Sleath</i>	
Applicability Of Performance-Based Standards To Truck Size And Weight Regulation In The United States.....	137
<i>J. York and T. Maze</i>	

Weigh-In-Motion

Australian High Speed Weigh-In-Motion —An Overview	143
<i>C. Koniditsiotis, R. Buckmaster, and P. Fraser</i>	
On-Site WIM System Calibration; An Overview Of NCHRP Study 3-39(2).....	153
<i>T. Papagiannakis and K. Senn</i>	

Vehicle Monitoring

Site-Specific Truck Load Study.....	159
<i>S. Kim, A.S. Nowak, and A.F. Sokolik</i>	
A System For Monitoring Overloaded Vehicles.....	165
<i>P.A. Nordengen and M.C. Hellens</i>	
Characteristics Of Heavy Traffic On Various French Roads.....	175
<i>D. Pillot</i>	

Vehicle Manufacturing

Truck Manufacturing In The World Market Of The Twenty-First Century	183
<i>J. Hebe</i>	

INFRASTRUCTURE TECHNOLOGY

Modeling Pavement Response And Performance

Field Response And Dynamic Modeling Of An Asphalt Concrete Pavement Section Under Moving Heavy Trucks	189
<i>K. Chatti, J.P. Mahoney, C.L. Monismith, and T. Moran</i>	
Modelling Whole-Life Pavement Performance.....	201
<i>A. Collop and D. Cebon</i>	
Simulation Of The Response Of Cracked Flexible Pavements To Surface Loads.....	213
<i>M.S.A. Hardy</i>	
Calibration Of A Mathematical Vehicle Dynamic Model.....	221
<i>W.J. Kenis and J. Hammouda</i>	

Pavement Performance

The Effect Of Wheel Loads On Pavements	235
<i>M. Huhtala</i>	
Strain Measurements In Flexible Pavements Under Heavy Vehicle Axle Loads.....	243
<i>B.D. Pidwerbesky and B.D. Steven</i>	
Effect Of Heavy Vehicle Weights On Pavement Performance.....	253
<i>C.L. Saraf, G.J. Ilves, and K. Majidzadeh</i>	
Effect Of Vehicle Axle Loads On Pavement Performance	263
<i>B.M. Sharma, K. Sitaramanjaneyulu, and P.K. Kanchan</i>	

Spatial Repeatability

Spatial Repeatability Of The Impact Forces On A Pavement And Multiple Sensor WIM—Research Element 5 Of The OECD IR6 DIVINE Project	273
<i>B. Jacob</i>	
Spatial Correlation Of Dynamic Wheel Loads	281
<i>P.A. LeBlanc and J.H.F. Woodrooffe</i>	
A Demonstration Of The Theory of Spacial Repeatability	291
<i>T. Moran, M. Sullivan, J. Mahoney, and K. Chatti</i>	

Road Loads And Simulators

A Study Of Dynamic Wheel Loads Conducted Using A Four-Post Road Simulator	301
<i>B.T. Kulakowski, D.A. Streit, R.J. Wollyung, and W.J. Kenis</i>	
Replication Of Heavy Truck Dynamic Wheel Loads Using A Road Simulator	309
<i>T. Moran, M. Sullivan, D. Menmuir, and J. Mahoney</i>	
Measurement Of Heavy Vehicle Dynamic Wheel Forces Using A Bolt-On Transducer	317
<i>W. Yang, C. Doedhar, D.A. Streit and B.T. Kulakowski</i>	

Dynamic Wheel Loads And Pavements

The Impact Of Vehicle Dynamics On Pavement Performance	323
<i>J. de Pont and B. Pidwerbesky</i>	
Implementation Of Road Profiles For Vehicle Dynamic Simulation	333
<i>W.J. Kenis and J. Hammouda</i>	
Dynamic Pavement Loads And Road Wear: Scientific Questions The OECD DIVINE Project Is Intended To Answer	341
<i>C.G.B. Mitchell and R.R. Addis</i>	
An International Research Program Into The Vehicle/Pavement Interaction: OECD DIVINE Project	351
<i>P.F. Sweatman, R.R. Addis, and C.G.B. Mitchell</i>	

Bridge Loading And Response

Vehicle/Bridge Interaction For Medium Span Bridges—Research Element 6 Of The OECD IR6 DIVINE Project	355
<i>S. Barella and R. Cantieni</i>	
Short-Span Bridge Friendly Suspensions—Research Element 6 Of The OECD DIVINE Project	365
<i>R.J. Heywood</i>	
Fatigue Load Spectra For Bridges	377
<i>J.A. Laman and A.S. Nowak</i>	
Dynamic Effect Of Truck Loads On Girder Bridges	383
<i>H.H. Nassif and A.S. Nowak</i>	

Geometry And Other Issues

Measurement Of The Lateral Distribution Of Heavy Vehicles And Its Effects On The Design Of Road Pavements	389
<i>R. Blab and J. Litzka</i>	
Truck Length And Weight Issues: Passing And Turning At Intersections	397
<i>P.S. Fancher, Z. Bareket, and M.R.A. Russo</i>	
Geometric Considerations Of Long Combination Vehicle Maneuvers On Roadway Intersections In Brazil	405
<i>M.R.A. Russo and J.A. Widmer</i>	

VEHICLE TECHNOLOGY

Vehicle Dynamics Simulation

Simulating In-Service Heavy Vehicle Suspension Dynamics	415
<i>J. de Pont, K. Thakur, and M. Costache</i>	
Axle Tramp Contribution To The Dynamic Wheel Loads Of A Heavy Truck	425
<i>S.M. Karamihas, T.D. Gillespie, and S.M. Riley</i>	

Simulation Modeling And Performance Standards For Combination Vehicles	435
<i>S. McFarlane, P. Dovile, and P.F. Sweatman</i>	
Study Of An Active Suspension For Improved Ride Quality And Reduced Dynamic Wheel Loads.....	441
<i>F. Oueslati, S. Rakheja, and S.Sankar</i>	
Dedicated Simulations Of Heavy Road Vehicles	453
<i>C.H. Verheul</i>	

Articulated Vehicle Behavior

Standard Test Procedures For The Lateral Stability Of Heavy Vehicle Combinations.....	463
<i>J. Aurell and C.B. Winkler</i>	
Path Compliance In Lane-Change Tests Designed To Evaluate Rearward Amplification.....	473
<i>J. Preston-Thomas and M. El-Gindy</i>	

Stability And Safety

A Study Of The Aligning Forces Generated From A Tridem Drive Axle Group.....	483
<i>E. Amlin, P. Klawer, and D.V. Hart</i>	
Impact Of European Size And Weight Policies On The Characteristics Of Heavy Vehicles	493
<i>J. Aurell and T. Wadman</i>	
Headway Control Systems And The Heavy Commercial Vehicle—A Case Study	507
<i>Z. Bareket and P.S. Fancher</i>	
Computer Optimization Of Heavy Truck Suspension Parameters.....	517
<i>D.W. Blue and B.T. Kulakowski</i>	
Evaluation Of Self-Steering Axles For Semi-Trailers	525
<i>G. Corbin, J. Grandbois, and M.J. Richard</i>	
Urban Truck Crashes—What Really Happens	537
<i>P.F. Sweatman and K.W. Ogden</i>	
Stability In The Real World—Influence Of Drivers And Actual Roads On Vehicle Stability Performance.....	545
<i>D. White and K. Thakur</i>	

Brakes And ABS

Further Experience With Anti-Lock Brake Systems.....	551
<i>J.R. Billing, C.P. Lam, and S. Vespa</i>	
Statistical And Mechanical Analyses Of Brake Adjustment Criteria For Heavy Trucks.....	563
<i>P. Fancher, Z. Bareket, D. Blower, and K. Campbell</i>	
Heavy Truck Brake Adjustment—Problems And Solutions.....	575
<i>H. Seiff</i>	

Tires

A Combined Cornering And Braking Test For Heavy Duty Truck Tires.....	583
<i>M.G. Pottinger, W. Pelz, C.B. Winkler, and G.A. Tapia</i>	

ENDNOTE PRESENTATIONS

Technical Issues—The Way Forward.....	593
<i>R.D. Ervin</i>	