

ALLAN M. ZAREMBSKI Ph.D., P.E., F.A.S.M.E., Hon. Mbr. AREMA
Professor of Practice and Director of Railroad Engineering and Safety Program

Summary of Qualifications:

Over forty five years of professional engineering responsibility. Extensive experience in all areas of rail operations to include freight and passenger operations, transit, commuter and inter-urban. Internationally recognized expertise in the area of railway track and structures, vehicle-track dynamics, wheel-rail interaction, rail and track component failure and failure analysis, rail grinding and maintenance, safety, railway operations, and maintenance. Consulting services provided to virtually all major rail operations in North America together with numerous operations worldwide. Teaching of university level (undergraduate and graduate) courses and professional short courses.

PROFESSIONAL HISTORY:

- September 2015 **University of Delaware, Department of Civil and Environmental Engineering**
to present Professor of Practice and Director of Railroad Engineering and Safety Program
Develop and teach railroad engineering courses for seniors and graduate students. Develop railroad engineering and safety program to include courses and research activities in the areas of railroad track engineering, vehicle-track dynamics, wheel-rail interaction, failure and failure analysis, railway safety, railway economics, and railroad operations and maintenance. Develop and teach professional courses in railroad engineering and safety.
- August 2012 **University of Delaware, Department of Civil and Environmental Engineering**
to August 2015 Research Professor and Director of Railroad Engineering and Safety Program
Develop and teach railroad engineering courses for seniors and graduate students. Develop railroad engineering and safety program to include courses and research activities in the areas of railroad track engineering, vehicle-track dynamics, wheel-rail interaction, failure and failure analysis, railway safety, railway economics, and railroad operations and maintenance. Develop and teach professional courses in railroad engineering and safety.
- September 2007 **ZETA-TECH, an Independent Business Unit of Harsco Rail**
to July 2012 Vice President and General Manager
Directed activities in track maintenance planning and planning software, vehicle-track dynamics and interaction, wheel-rail interface and interaction, rail and track analyses, economic analyses of railroad

operations, and railway costing. Special areas of activity include rail failure and maintenance, rail grinding, wheel-rail interaction, railroad track structure, vehicle-track dynamics, fatigue and failure analysis, safety, and risk management.

1984
to 2007

ZETA-TECH Associates, Inc., Cherry Hill, New Jersey

President

Directed activities in track maintenance planning and planning software, vehicle-track dynamics and interaction, rail and track analyses, economic analyses of railroad operations, and railway costing. Special areas of activity include wheel-rail interaction and interface, rail grinding, railroad track structure, vehicle-track dynamics, fatigue and failure analysis, safety, and risk management. Started and grew company to 25 employees, working for every major railroad and transit system in US and many worldwide.

1981 -
1984

Pandrol Inc. /Speno Rail Services Co.

Director Research & Development

Dual responsibility for both companies in directing all research and development activities for new products, new systems, and future corporate activities. Reported directly to the President. Responsible for all railroad technology activities including product application, advertising, and technical support. Special areas of activity include wheel-rail interface, rail grinding, rail life extension, elastic fastener systems, track strength, and track component failure.

1976 -
1981

Association of American Railroads

Manager - Track Research Division

December 1978 to September 1981

Directed Division Responsible for conducting major research programs on railroad track. Directed AAR Track Laboratory. Conducted extensive field and laboratory tests as well as analytical research programs.

Assistant Manager - Track Research Division

August 1978 to December 1978

Initiated major research programs in Track Strength, Rail Fatigue, Ballast Failure Mechanisms, etc.

Senior Research Engineer

August 1976 to August 1978

Responsible for research programs on freight car fatigue design, rail overturning, and track gage widening. Developed industry standard methodology for fatigue design of freight cars. Developed test plans and procedures for AAR Track Laboratory.

1975 - **Princeton University**
1976 Research Associate - Dept. of Civil Engineering
Conducted research activities in the area of lateral (railroad) track deformation and track buckling. Conducted laboratory tests at civil engineering laboratory.

1971 - **Grumman Aerospace Corp.**
1973 Engineer
Responsibility for design and analysis of military aircraft structural components. Also conducted dynamic analyses of aircraft structures.

EDUCATION:

Sept. 1975 Ph.D. Civil Engineering; Princeton University
June 1974 M. A. Civil Engineering; Princeton University
Jan. 1973 M. S. Engineering Mechanics; New York University
Jan. 1971 B. S. (Magna Cum Laude) Aeronautics and Astronautics; New York University

PROFESSIONAL AFFILIATIONS:

Registered Professional Engineer: NJ, NY, PA, IL, MD

MEMBER:

American Railway Engineering and Maintenance of Way Association (Honorary Member)
American Society of Mechanical Engineers (Fellow)
American Society of Civil Engineers (Life Member)

HONORS AND AWARDS:

- Awarded The Fumio Tatsuoka Best Paper Award for 2017 by the Journal of Transportation Infrastructure Geotechnology
- Organizer: “Big Data in Railroad Maintenance Conference”, December 2020 (virtual) December 2019, December 2018, December 2017, December 2016, December 2015, December 2014
- Appointed Professor of Practice, Department of Civil and Environmental Engineering, University of Delaware, September 1, 2015.
- Appointed Research Professor and Director of Railroad Engineering and Safety Program, Department of Civil and Environmental Engineering, University of Delaware, August 1, 2012.
- Elected Honorary Member of American Railway Engineering and Maintenance of Way Association (AREMA) in 2010.
- Received Federal Railroad Administration’s SPECIAL ACT AWARD, February 2001
- Elected Fellow of the American Society of Mechanical Engineers in 2000
- 1992 Rail Transportation Award, American Society of Mechanical Engineers

- Associate Editor, Railway Track and Structures Magazine, January 1985 to 1996. Author of monthly column; "Tracking R&D"
- Member: National Academy of Sciences, National Materials Advisory Board; Committee on Nondestructive Testing of Longitudinal Force in Rails
- Member: Office for Research and Experiments of the International Union of Railway; Committee D150
- Delegate: American Railway Engineering Association Railroad Delegation to the Peoples Republic of China, 1983
- Deputy Director - International Government Industry Research Program on Track Train Dynamics
- Patent 8,345,948 Automated Turnout Inspection granted January 1, 2013
- Author of 214 papers on railroad track analysis and behavior, rail fatigue, and freight car design and analysis
- Author of over 130 articles on railway operations and maintenance, published in all of the major U.S. and international (English speaking) industry publications
- Author of the book Tracking R&D; Research and Development, Simmons Boardman, Omaha, NE, 1993
- Author of the book The Art and Science of Rail Grinding, Simmons Boardman, Omaha, NE, 2005
- Taught courses and/or seminars at:
 - University of Illinois Champaign Urbana
 - University of Nevada Las Vegas
 - Columbia University
 - University of Wisconsin
 - Technion, Haifa, Israel
 - China Academy of Railway Sciences, Beijing China
 - Astana, Kazakhstan
 - Brazil (Belo Horizonte, Sao Paulo, Sao Luis)
 - New Delhi, India

NOTABLE ACCOMPLISHMENTS:

- Introduced the concept of maintenance grinding of rail in the early 1980s and developed the original grinding processes, procedures and patterns for the first automated rail grinding machine (Speno RMS-1) which have since been adopted internationally. Developed and proved application of rail grinding to reduce the development of rail fatigue defects and extend life of rail. Rail grinding is now a common and extensively used international rail maintenance practice. Zarembski's textbook "Art and Science of Rail Grinding", Simmons Boardman Books 2005, is the industry standard book on rail grinding.
- Responsible for introduction of heavy axle load, 286,000 lb. freight cars (36 ton axle load cars) in North America. Led the analysis team that analyzed the engineering and economic impacts of these heavier cars for Burlington Northern Railroad in the early 1990s which led to their purchase and introduction of these heavy axle load freight cars in the mid-1990s. These cars were subsequently introduced on all North American railroads

and are currently the industry standard for heavy axle load freight cars in North America and worldwide.

- Developed track component failure and degradation models to include rail life models, risk based rail testing models, tie life models, track geometry degradation models, etc. that have been and remain in active use. These models allowed for the forecasting of the rate of component degradation (rails, ties, ballast/track geometry) and the implementation of maintenance planning models which allowed for more efficient and cost-effective track maintenance, replacement and upgrading by railroads and rail transit systems.
- Initiated, Organized and Ran Big Data in Railroad Maintenance Planning Conference annually from 2014 through 2021 (next conference scheduled December 2022).

BOOKS

1. Zarembski, A.M., Tracking R&D, Research & Development, **Simmons-Boardman Books, Inc.**, Omaha, NE, March 1993
2. Zarembski, A.M., The Art and Science of Rail Grinding, **Simmons-Boardman Books, Inc.**, Omaha, NE, August 2005

BOOK CHAPTERS

1. The Railroad: What It Is, What It Does, Chapter 3: The Track: Alignment and Structure, **Simmons Boardman Books, Inc. 2008**
2. Guidelines to Best Practices for Heavy Haul Railway Operations, Chapter 6.7 Maintenance Management Analysis Tools, **International Heavy Haul Association, 2009**

PUBLICATIONS

1. Zarembski, A. M., “Rail Rollover - The State of the Art”, **Bulletin of the American Railway Engineering Association, Bulletin 664, Volume 79**, September - October 1977.
2. Zarembski, A. M., “Freight Car Environment Characterization for Fatigue Life Analysis”, **Track/Train Dynamics and Design, Advanced Techniques**, Pergamum Press, N.Y., 1978.
3. Garg, V. K., Prasad, B., & Zarembski, A. M., “Structural Dynamic Analysis & Fatigue Life Prediction of a Flat Car”, **1977 Technical Proceedings 14th Annual Railroad Engineering Conference**, Pueblo, CO, March 1978.

4. Abbott, R. A., & Zaremski, A. M., "On the Prediction of the Fatigue Life of Rails", **Bulletin of the American Railway Engineering Association**, Bulletin 666, Volume 79, January - February 1978, p.p. 191-203.
5. Zaremski, A. M., & Abbott, R. A., "Fatigue Analysis of Rail Subject to Traffic and Temperature Loading", **Heavy Hauls Railways Conference**, Perth, Western Australia, September 1978.
6. Zaremski, A. M., "On the Nondestructive In Track Measuring the Longitudinal Force", **Conference on Nondestructive Techniques for Measuring the Longitudinal Force in Rails**, Washington, D.C., February 1979.
7. Zaremski, A. M., "Effect of Rail Section and Traffic on Rail Fatigue Life", **American Railway Engineering Association, 78th Annual Technical Conference**, Chicago, IL, March 1979.
8. McConnell, D. P., Zaremski, A. M., & Lovelace, W. S., "Track Strength Characterization Program an Overview", **American Railway Engineering Association, 78th Annual Technical Conference**, Chicago, IL, March 1979.
9. Darien, N. J., & Zaremski, A. M., "Railroad Freight Equipment Load Environment Testing", **25th International Instrumentation Symposium**, Anaheim, CA, May 1979.
10. Torkamani, M. A. M., Bhatti, M. H., & Zaremski, A. M., "Dynamic Rail Overturning: Modeling and Application", **Third ASCE/EMD Specialty Conference**, Austin, TX, September 1979.
11. Zaremski, A. M., & Rassasian, M., "Track Gage Widening A Model Study", **Transportation Engineering Journal**, American Society of Civil Engineers, November 1979.
12. Choros, J., & Zaremski, A. M., "Track Strength Vehicle Testing on High Curvature Mainline Track", **Rail International**, July 1982.
13. Abbott, R. A., & Zaremski, A. M., "Longer Rail Life is Goal", **Modern Railroads**, December 1978.
14. Torkamani, M. A. M., Bhatti, M. H., & Zaremski, A. M., "Dynamic Rail Overturning: Modeling", **Rail International**, September 1980.
15. Torkamani, M. A. M., Bhatti, M. H., & Zaremski, A. M., "Dynamic Rail Overturning: Application", **Rail International**, October 1980.
16. Zaremski, A. M., "On the Feasibility of Continuous Measurement of Track Gauge Restraint", **Rail International**, July - August 1980.

17. Zarembski, A. M., "Rail Research: Meeting the Challenge of Modern Traffic Loading", Annual Meeting of the **Transportation Research Board**, January 1980. (Transportation Research Record 744).
18. Halcomb, S., & Zarembski, A. M., "Freight Car Fatigue Analysis: Guidelines and Application", **Track Train Dynamics Conference**, Chicago, IL, November 1979.
19. Lovelace, W. S., & Zarembski, A. M., "Future Directions in Track Evaluation and Inspection", **Track Train Dynamics Conference**, Chicago, IL, November 1979.
20. Zarembski, A. M., & Choros, J., "On the Measurement and Calculation of Vertical Track Modulus", **Bulletin of the American Railway Engineering Association**, Bulletin 675, Volume 81, November - December 1979.
21. Zarembski, A. M., & Choros, J., "Laboratory Investigation of Track Gauge Widening", **Bulletin of the American Railway Engineering Association**, Bulletin 676, Volume 81, January-February 1980.
22. Zarembski, A. M., McConnell, D. P., & Lovelace, W. S., "New Car for Measurement and Evaluation of Gage-Widening Resistance of Track", **American Railway Engineering Association, 79th Annual Technical Conference**, Chicago, IL, March 1980. (Bulletin 678, Volume 81, June - July 1980).
23. Kerr, A. D., & Zarembski, A. M., "The Response Equations for a Cross-tie Track", **ACTA Mechanical**, 40, 253-276, 1981.
24. Zarembski, A. M., & Choros, J., "Field Evaluation of Mainline Quality Track Using a Track Strength Test Vehicle", **Bulletin of the American Railway Engineering Association**, Bulletin 680, Volume 82, November - December 1980.
25. Zarembski, A. M., "The Track Modulus", **Roadmasters' and Maintenance of Way Association of America, Ninety-Third Annual Conference**, Chicago, IL, September 1981.
26. Zarembski, A. M., "The Direct Inspection of Track", **Railway Track and Structures**, November 1980.
27. Bhateja, R., & Zarembski, A. M., "Determination of Track Gage Widening Parameters", **International Conference on Computing in Civil Engineering**, New York, N. Y., May 1981.
28. Zarembski, A. M., & Magee, G., "An Investigation of Railroad Maintenance Practices to Prevent Track Buckling", **American Railway Engineering Association 80th Annual Technical Conference**, Chicago, IL, March 1981 (published in Bulletin 684, September 1981).

29. Webb, H. G., Wells, T., & Zarembski, A. M., "Track Maintenance Research Program: An Overview", **American Railway Engineering Association 80th Annual Technical Conference**, Chicago, IL, March 1981.
30. Zarembski, A. M., "Effect of Increasing Axle Loads on Rail Fatigue Life", **Bulletin of the American Railway Engineering Association**, Bulletin 685, Volume 83, November - December 1981.
31. Zarembski, A. M., et al, "The Effect of Increasing Axle Loads on Rail Fatigue Life", **Rail Technology: Proceedings of the Joint BR/AAR Seminar**, Frederick and Round, Nottingham, England, 1983.
32. Armstrong, Wells, Stone, & Zarembski, "Impact of Car Loads on Rail Defect Occurrences", **Second International Heavy Haul Railway Conference**, Colorado Springs, CO, September 1982.
33. Zarembski, A. M., "Performance Characteristics for Concrete Tie Fasteners", **Concrete Tie Systems for the 1980's**, Skokie, IL, November 1983.
34. Manos, Scott, Choros, & Zarembski, "Development of an Improved Vehicular Loading Characterization Associated with the Gage Strength of Track", **Bulletin of the American Railway Engineering Association**, Bulletin 686, Volume 83, January - February 1982.
35. Zarembski, A. M., "Performance Characteristics for Wood Tie Fasteners", **Bulletin of the American Railway Engineering Association**, Bulletin 697, Volume 85, October 1984, p.p. 341-369.
36. Zarembski, A. M., "The Impact of Rail Surface Defects", **Railway Track and Structures**, November 1984.
37. Zarembski, A. M., "The Economics of Rail Grinding and Rail Surface Maintenance", **Third International Heavy Haul Railway Conference**, Vancouver, British Columbia, October 1986.
38. Lamson, S. T., Zarembski, A. M., & Taylor, E. H., "Profile Grinding on CP Rail", **Joint British Rail/Association of American Railroads Seminar on Vehicle Track Interaction**, Princeton, NJ, April 1984.
39. Kerr, A. D., & Zarembski, A. M., "On the New Equations for the Cross-Tie Track Response in the Lateral Plane", **Rail International**, Number 6, 1986.
40. Zarembski, A. M., "Performance Characteristics for Concrete Tie Fasteners", **Rail International**, March 1987.
41. Zarembski, A. M., "The Relationship Between Rail Grinding and Rail Lubrication", **Second International Symposium on Wheel/ Rail Lubrication**, Memphis, TN, June 1987.

42. Zaremski, A. M., Izbinsky, G., Handal, S. N., & Worthington, W. M., "Corrugation Behavior in the Freight Railroad Environment", **American Railway Engineering Association (presented at the March 1987 Annual Conference, Chicago)**, Bulletin 712, Vol. 88, October 1987.
43. Zaremski, A. M., "The Evolution and Application of Rail Profile Grinding", **Bulletin of the American Railway Engineering Association**, Bulletin 718, Volume 89, December 1988.
44. Zaremski, A. M., "Track Maintenance Planning Using Forecasting Software", **Railway Technology International**, 1988.
45. Zaremski, A. M., & Masih, J. T. A., "On the Development of Computer Model for the Economic Analysis of Alternate Tie/Fastener Configuration", **American Railway Engineering Association (presented at the March 1989 Annual Conference, Chicago)**.
46. Newman, R. R., Zaremski, A. M., Resor, R. R., "Burlington Northern's Assessment of the Economics of High Capacity/Heavy Axle Load Cars", **Bulletin of the American Railway Engineering Association**, Bulletin 726, Volume 91, May 1990.
47. Newman, R. R., Zaremski, A. M., & Resor, R. R., "The Effect of Increased Axle Loads on Maintenance of Way and Train Operations at Burlington Northern", **International Heavy Haul Association /Transportation Research Board Workshop**, Vancouver, B.C., June 1991.
48. Zaremski, A. M., "Forecasting of Track Component Lives and its Use in Track Maintenance Planning", **International Heavy Haul Association/Transportation Research Board Workshop, Vancouver, B.C.**, June 1991.
49. Zaremski, A. M., "Track Maintenance Planning For Short Lines, Regionals", **Modern Railroads Short Lines and Regionals**, October 1988.
50. Zaremski, A. M., Palese, J. W., & Martens, J. H., "The Effect of Improved Rail Manufacturing Process on Rail Fatigue Life", **American Railway Engineering Association**, Bulletin 733, Volume 92, December 1991.
51. Newman, R. R., Zaremski, A. M., & Resor, R. R., "Economic Implications of Heavy Axle Loads on Equipment Design Operations and Maintenance", **American Society of Mechanical Engineering**, WAM, RTD-Volume 4, Rail Transportation, December 1991.
52. Zaremski, A. M., "Wood Tie Fastener Performance Requirements: The User's Points of View", **Symposium on Elastic Track Fasteners, American Railway Engineering Association**, Omaha, NE, June 1992.
53. Resor, R. R., & Zaremski, A. M., "Development of Track Maintenance Planning Models for Rail Rapid Transit Systems", **Computers in Railways III, Proceedings of the Third**

- International Conference (COMPRAIL 92)**, Vol. I: Management (Computational Mechanics Publications, Boston, 1992).
54. Zaremski, A. M., "Rail Life Analysis and its Use in Planning Track Maintenance", **Railway Technology International**, 1993.
 55. Zaremski, A. M., "Determining the Cost of Track Maintenance", **Railway Track and Structures**, April 1993.
 56. Zaremski, A. M., "Transit Rail Wear Standards", **American Public Transit Association**, Miami, June 1993.
 57. Zaremski, A. M., & Palese, J. W., "Rail Maintenance Planning Using Computerized Rail Forecasting Models", **Conference on Track Maintenance Practices on Suburban and Mass Transit Railways**, Hong Kong, June 1993.
 58. Zaremski, A. M., "Forecasting of Future Tie Requirements by Computer Modeling", **Crossties**, July/August 1993.
 59. Zaremski, A. M., & Bohara, A. P., "Controlling Rail and Wheel Wear on Commuter Operations", **American Railway Engineering Association**, Bulletin 742, Volume 94, October 1993.
 60. Zaremski, A. M., & McCarthy, W. T., "Development of Non-Conventional Tie and Track Structure Inspection Systems", **Workshop on Innovations in Maintenance of Way Work Equipment, Cosponsored by Transportation Research Board and Roadmasters and Maintenance of Way Association**, Denver, CO, September 1993. Also published in "Transportation Research Record No. 1489: Rail", Railroad Transportation Research, Transportation Research Board, National Research Council, Washington, DC, 1995.
 61. Zaremski, A. M., & McCarthy, W. T., "Testing Track Strength and Wood-Tie Condition", **Railway Track and Structures**, September 1993.
 62. Zaremski, A. M., "Track Maintenance Costing: Alternative Approaches", **Conference on Maintaining Railway Track; Determining Cost and Allocating Resources**, Arlington, VA, October 1993.
 63. Zaremski, A. M., "Concrete vs. Wood Ties: Making the Economic Choice", **Conference on Maintaining Railway Track; Determining Cost and Allocating Resources**, Arlington, VA, October 1993.
 64. Zaremski, A. M., "Incremental Costs Incurred for Track Maintenance", **Conference on High Speed Trains on Freight Railroads**, Washington, D.C., November 1994.
 65. Zaremski, A. M., "Computerized Maintenance Planning and Reporting Systems", **Rail Transit '95: Design, Construction and Maintenance of Transit Track and Structures**, New York, NY, June 1995.

66. Zarembski, A. M., "Development of Rail Gage Face Angle Standards to Prevent Wheel Climb Derailments", **American Railway Engineering Association Annual Technical Conference**, Chicago, IL, March 1996.
67. Zarembski, A. M., "On the Use of Timber Sleepers in Main Tracks", **World Railway Equipment and Technology Update 1996/1997**, Kensington Publications Ltd., London, England, 1996.
68. Zarembski, A. M., "On the Benefits of Rail Maintenance Grinding", **American Railway Engineering Association Annual Technical Conference**, Bulletin 760, Volume 98, Chicago, IL, March 1997.
69. Zarembski, A. M., Holfeld, D. R., and Palese, J. W., "On the Derailment of Rail Vehicles Through Turnouts: A Review of Derailment Causes and Mechanisms", **American Railway Engineering Association Turnout Symposium**, Chicago, IL, August 1996.
70. Zarembski, A. M., "Track Inspection: Knowing What is Out There", **Railway Track and Structures 1997 Track Buyers Guide**, Chicago, IL, 1997.
71. Zarembski, A. M., "Modern Rail Grinding Techniques: Selecting the Proper Grinding Approach", **Railway Gazette International**, London, England, February 1997.
72. Zarembski, A. M., Holfeld, D. R., and Palese, J. W., "Derailment of Transit Vehicles in Turnouts", **Transportation Research Board Annual Meeting**, Washington, DC, January, 1997.
73. Zarembski, A. M., "Recent Developments in Maintenance Planning Systems", **Railway Track and Structures**, Chicago, IL, February 1997.
74. Zarembski, A. M. and Holfeld, D. R., "On the Prediction of the Life of Wood Crossties", **American Woodtie Preservers Association Conference**, Pittsburgh, PA, April 1997.
75. Zarembski, A. M. and Holfeld, D. R., "On the Prediction of the Life of Wood Crossties", **Crossties Magazine**, May/June and July/August, 1997.
76. Holfeld, D. R., and Zarembski, A. M., "Knowledge Transfer: Utilizing New Technologies" **Sixth International Heavy Haul Railway Conference**, Capetown, South Africa, April 1997.
77. Zarembski, A. M., "Development and Implementation of Integrated Maintenance Planning Systems", **Transportation Research Board Annual Meeting**, Washington, DC, January, 1998.
78. Zarembski, A.M., and Gauntt, J.C., "Evaluation of Life Cycle Costs of Alternate Tie (Sleeper)/Fastener Systems and Their Use in Defining Maintenance Policy and Practice", **WCRR Conference**, Florence, Italy, November 1997.

79. Zarembski, A.M, “The Economics of Increasing Axle Loads”, **European Railway Review**, London, England, June 1998.
80. Zarembski, A.M., “Enhanced Tie Condition Inspection Using Hand Held Recording Systems”, **Crossties Magazine**, August 1998.
81. Zarembski, A.M., Thornton, D., Palese, J.W., Forte, N., “Development and Implementation of RailGraph; A Field Deployable Rail Maintenance Management Tool”, **American Railway Engineering Maintenance Association Annual Technical Conference**, 1998.
82. Zarembski, A.M., and Paulsson, Bjorn, “Introduction of Heavy Axle Loads in Europe: Economics of 30 Tonne Axle Load Operations on the Malmbanan”, **European Railway Review**, 1998
83. Zarembski, A.M, Palese, J.W., and Katz, Leonid “Implementation of a Dynamic Rail-Highway Grade Crossing Transition”, **Transportation Research Board Annual Meeting**, Washington, DC, January, 1999.
84. Zarembski, A.M, “Determination of Future Crosstie Requirements from Gage Strength Measurements”, **Crossties Magazine**, March/April 1999.
85. Zarembski, A.M. Chiddick, A.S. “Application of New Lubricant Formulations For The Reduction of Wheel Squeal Noise Under Freight and Passenger Service”, **American Society of Mechanical Engineers Joint Technical Conference with AREMA**, September 1999
86. Zarembski, A.M., “Use of Track Strength Data in the Determination of Future Crosstie Requirements”, **American Railway Engineering Maintenance Association Annual Technical Conference**, September 1999
87. Zarembski, A.M, & Palese, J.W., “Application of Maintenance of Way Information Systems to Enhance Operations and Safety”. **Passenger Transport, American Public Transit Association**, October 1999.
88. Bonaventura, Clifford S., Palese, Joseph W. & Zarembski, A.M., “Intelligent System for Real-Time Prediction of Railway Response to the Interaction with Track Geometry”. **American Society of Mechanical Engineers, 2000 Spring ASME/IEEE Joint Rail Conference**, April 2000.
89. Gauntt, J.C., & Zarembski, A.M., “Analysis of Wood Cross-Tie Price Sensitivities”. **American Railway Engineering Maintenance Association Annual Technical Conference**, September 2000.
90. Zarembski, A.M., “The Implications of Heavy Axle Load Operations for Track Maintenance on Short Lines”. **American Railway Engineering Maintenance Association Annual Technical Conference**, September 2000.

91. Zarembski, A.M., & Blaze, J., "Small Roads and Heavy Loads". **Railway Age Magazine**, April 2000.
92. Zarembski, A.M., & Kondapalli, Sunil K., "Ballast Shoulder Cleaning: Issues and Economics", submitted for publication **Railway Age Magazine**, June 2000.
93. Resor, R.R., Zarembski, A.M., & Patel, P.K., "An Estimation of the Investment in Track and Structures Needed to Handle 286,000 lb. Rail Cars on Short Line Railroads", **Transportation Research Board**, 2000.
93. Palese, J.W., & Zarembski, A.M., "BNSF Tests Risk-Based Ultrasonic Detection", published **Railway Track & Structures Magazine**, February 2001.
94. Zarembski, A.M., Palese, J.W., & Bell, J.G., "Limiting High Speed Dynamic Forces on the Track Structure; The Amtrak Acela Case", **American Railway Engineering Maintenance Association Annual Technical Conference**, Sept 2001.
96. Redden, J.W.P., Selig, E.T. & Zarembski, A.M., "Design Considerations in Stiff Track Modulus Environments", **Railway Track & Structures Magazine**. February 2002
97. Zarembski, A.M, Palese, Joseph W., and Katz, Leonid "Reduction of Dynamic Wheel/Rail Impact Forces at Grade Crossings Using Stiffness Transitions", **American Society of Mechanical Engineers, 2001 ImechE Congress**, New York, NY, November 2001
98. Zarembski, A.M., Palese, J.W., Bell, J.G., "Controlling Track Forces during Introduction of New High Speed Trains", **International Railway Journal**, October 2001
99. Zarembski, A.M., Turner, F., "Funding Infrastructure Upgrade Needs on Short Lines", **Railway Age Magazine**, December 2001.
100. Turner, R., Zarembski, A.M., "Helping Shortlines Meet the Challenges of HAL", published **Railway Track & Structures Magazine**, November 2001.
101. Lee, T., Zarembski, A.M., Weisgerber, J., "Use of New Generation Maintenance of Way Information System on Toronto Transit", **Railway Track & Structures Magazine**, May 2002.
102. Zarembski, A.M., Parker, L.A., Palese, J.W., Bonaventura, C., "Computerized Tie Condition Inspection and Use of Tie Condition Data in Cross-Tie Maintenance Planning", **International Heavy Haul Conference**, May 2003.
103. Zarembski, A.M., Parker, L.A., Palese, J.W., "Use of Comprehensive Tie Condition Data in Cross-Tie Maintenance Planning and Management on the BNSF", **American Railway Engineering Maintenance Association Annual Technical Conference**, September 2002.

104. Zarembski, A.M., Gauntt, J.C., “Development of a Tie Usage Index for Matching Wood Performance and Operating Conditions”, **American Railway Engineering Maintenance Association Annual Technical Conference**, September 2002.
105. Zarembski, A.M., Bell, J.G., “Limiting the Effects of High-Speed Dynamic Forces on Track Structure”, published **TR News**, September-October 2002
106. Bonaventura, C.S., Palese, J.W., Zarembski, A.M., “Real-Time Prediction of Railway Vehicle Response to the Interaction with Track Geometry”, **International Heavy Haul Conference**, May 2003.
107. Zarembski, A.M., Blaze, J., “The Economics of Heavy Axle Loads: Costs and Benefits”, published at the **Heavy Haul: The Solution for Europe’s Future**, Paris, March 2003.
108. Zarembski, A.M., Blaze, J., “The Economics of Heavy Axle Loads: Costs and Benefits”, **International Railway Journal**, April 2003.
109. Zarembski, A.M., Palese, J.W., “Risk Based Ultrasonic Rail Test Scheduling: Practical Applications in Europe and North America, **Conference Contact Mechanics and Wear of Rail/Wheel Systems (CM2003)**, Gothenburg, Sweden, June 2003.
110. Zarembski, A.M., Resor, R. R., Patel, P., “Economics of Wayside Inspection Systems”, **2003 ASME International Mechanical Engineering Congress and Exposition (IMECE’03)**, Washington, DC, November 16-21, 2003.
111. Zarembski, A.M., Weisgerber, J., “Implementation of a New Generation of Maintenance of Way Information Systems for Transits”, **AREMA 2003 Annual Conference & Exposition**, Chicago, IL, October 5-8, 2003.
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GRADUATE STUDENTS

Masters (completed)

Samet Ozturk Spring 2014

A STUDY ON THE WHEEL-RAIL INTERACTION

AT SWITCH POINTS TO REDUCE DERAILMENTS IN TURNOUTS

John Cronin Spring 2014
ON THE DEVELOPMENT OF WEIGHTING FACTORS FOR BALLAST RANKING
PRIORITIZATION & DEVELOPMENT OF THE RELATIONSHIP AND RATE OF
DEFECTIVE SEGMENTS BASED ON VOLUME OF MISSING BALLAST

Dan Eibinder Summer 2015
THE DEVELOPMENT OF RAIL DEFECTS DUE TO THE PRESENCE
OF GEOMETRY DEFECTS IN CLASS 1 RAILROADS

Ali Alsahli Summer 2016
A STUDY ON REDUCING DERAILMENTS AT TURNOUT

Truxton Boyce Fall 2016
DEVELOPMENT OF A RISK-BASED INSPECTION SCHEDULING
METHODOLOGY FOR AUDIT INSPECTIONS OF RAILROAD CURVES
ON HIGH SPEED MAIN LINE TRACK

Kyle Ebersole Spring 2019
ANALYSIS OF WHEEL WEAR AND FORECASTING OF WHEEL LIFE
FOR TRANSIT RAIL OPERATIONS

Michael Palese February 2021
BALLAST PARTICLE BEHAVIOR UNDER VARYING CONDITIONS USING TRI-AXIAL
INERTIAL SENSORS

Kenza Soufiane Spring 2021
IMPACT OF ADJACENT SUPPORT CONDITION ON PREMATURE CROSSTIE FAILURE

Mike Nguyen Spring 2022
Analysis of Relationship Between Track Geometry Defects and Measured Track Subsurface
Condition Using Different Machine Learning Methods

Mohammed Abdullah J Alzhrani Spring 2023

PhD

Joseph Palese Summer 2019
A DATA DRIVEN APPROACH TO RAIL WEAR MODELLING

Dennis Yurlov Fall 2018

RELATIONSHIP BETWEEN TRACK GEOMETRY DEFECTS AND
MEASURED TRACK SUBSTRUCTURE CONDITION USING EMERGING
DATA ANALYSIS METHODS

Ali Alsahli Fall 2018
CORRELATING GEOMETRY AND TIE DEFECTS
USING TRACK AUTOMATED INSPECTION DATA

John Cronon Fall 2020

ON THE DEVELOPMENT OF A PREDICTIVE RAIL MAINTENANCE
PLANNING METHODOLOGY UTILIZING PARAMETRIC
WEIBULL PREDICTION METHODS

Michael Palese started Spring 2021

Kenza Soufiane started Fall 2021