

# *McHenry Consultants, Inc.*

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## Resume of **Raymond R. McHenry**

### **Professional Experience**

**1980 to date.** Staff Scientist, McHenry Consultants, Inc., Cary, North Carolina. Technical Duties: Investigation of highway accidents. Application of analytical and experimental techniques to the reconstruction of vehicle and occupant dynamics in highway collisions. Evaluation and analysis of vehicle defects and failure modes. Performance of research related to highway safety.

**1978 to 1980.** Staff Scientist, Research Engineers, Inc., Research Triangle Park, North Carolina. Technical duties: Application of analytical and experimental techniques to the reconstruction of vehicle and occupant dynamics in highway collisions. Evaluation and analysis of vehicle defects and failure modes. Performance of research related to highway safety.

**1961 to 1978.** Staff Scientist, Calspan (formerly Cornell Aeronautical Laboratory, Inc.), Buffalo, New York. Technical duties: As a Staff Scientist with Calspan Field Services, Inc., and previously with Calspan Corporation, Mr. McHenry was responsible for the technical direction of a variety of research projects related to the improvement of highway safety. He was involved in the application of analytical and experimental techniques to the problems of occupant protection in collisions and he analyzed automobile dynamics in single vehicle accidents and in violent evasive maneuvers. He also served as the Principal Investigator on the development of techniques for analytical reconstruction of highway accidents [Simulation Model of Automobile Collisions (SMAC) and Calspan Reconstruction of Accident Speeds on the Highway (CRASH)].

Mr. McHenry developed techniques for study of physical criteria for roadside structures and cross-section designs by mathematically modeling the dynamics of single vehicle accidents [Highway Vehicle Object Simulation Model (HVOSM)]. He performed analyses and developed computer simulations of the dynamics of automobile braking and of the ride and steering dynamics of the Westinghouse Transit Expressway Vehicle. He studied advanced technology applicable to highway transportation in the Boston-Washington Corridor in 1980. He developed a nonlinear mathematical model of the automobile crash victim and mathematical models of highway guardrails and test vehicles for simulation of impact.

**1960 to 1961.** Technical Advisor, American Machine & Foundry Company, Greenwich, Connecticut. Technical duties: Mr. McHenry was technical advisor on the design of vehicles for aircraft cargo loading (Air Force 463L System).

**1956 to 1960.** Senior Design Engineer, Ford Motor Company, Dearborn, Michigan. Technical duties: Senior Design Engineer and Project Engineer on programs involving experimental hydropneumatic suspension vehicles, air suspension vehicles, and stroke-sensitive shock absorber design and development. Member of the Ford Advanced Ride and Handling Committee.

**1953 to 1956.** Chrysler Corporation, Highland Park, Michigan. Technical Duties: Participated in various experimental suspension and chassis component design and development programs. He also served as a mathematics instructor in calculus, analytic geometry and algebra (Lawrence Institute of Technology, Chrysler Institute, Detroit).

## Education

Graduate Studies, State University of New York, 1962, 1964.

Graduate Studies, Cornell University, 1961.

Master of Science Degree, Automotive Engineering, Chrysler Institute, 1955.

Bachelor of Science Degree, Engineering Physics, University of Maine, 1953.

## Professional Activities and Honors

Registered Professional Engineer, Connecticut, No. 5207.

Sigma Xi

Tau Beta Pi

Crompton-Lanchester Medal of the Automobile Division, The Institution of Mechanical Engineers (London), 1969.

The Safety Award in Mechanical Engineering, The Institution of Mechanical Engineers (London), 1969.

"Man of the Year" Award, 1967, from Science & Technology on the Niagara Frontier, official publication of Technical Societies Council.

American Men and Women of Science, 12th Edition, The Physical and Biological Sciences.

## Selected Publications (from a total of more than 45 technical papers and 40 technical reports)

1. "Analysis of Spring Installations for Low-frequency Suspension of Vehicles", Industrial Mathematics, Vol. 10, Part I, 1960, Industrial Mathematics Society, Detroit, Michigan.
2. "Research for Better Barriers-Analytical Prediction of Highway Barrier Performance Confirmed by Crash Testing", Research Trends, Vol. X, No. 3, 1962, Calspan Corporation.
3. "Analysis of the Dynamics of Automobile Passenger- Restraint Systems", Seventh Stapp Car Crash Conference, University of California and University of Minnesota, Playa Del Rey, California, 11-13 November 1963.
4. "Highway Guardrails - A Review of Current Practice", National Cooperative Highway Research Program Report 36, Transportation Research Board, Washington, D.C., 1967 (with N. J. Deleys).
5. "Computer Simulation of Single Vehicle Accidents", Society of Automotive Engineers Transactions, 1968 (with D. J. Segal and N. J. Deleys).
6. "An Analysis of the Dynamics of Automobiles During Simultaneous Cornering and Ride Motions", Proceedings of the Symposium on Handling of Vehicles Under Emergency Conditions, Institution of Mechanical Engineers (London), Loughborough University of Technology, 8 January 1969.

7. "Mathematical Models for Injury Prediction", Impact Injury and Crash Protection (Charles C. Thomas, publisher), Springfield, Illinois, 1970.
8. "A Review of the Current State of the Art of Automobile Structural Crashworthiness", 1970 International Automobile Safety Conference Compendium, Society of Automotive Engineers, 1970 (with P.M. Miller).
9. "Multidegree, Nonlinear Mathematical Models of the Human Body and Restraint Systems; Applications in the Engineering Design of Protective Systems", Symposium on Biodynamic Models and Their Applications, Wright- Patterson Air Force Base, Dayton, Ohio, 26-28 October 1970.
10. "An Analytical Aid for Evaluating Highway and Roadside Geometrics", Highway Research Record Number 371, National Research Council, National Academy of Sciences, Washington, D.C., 1971 (with N.J. Deleys and J.P. Eicher )
11. "Research in Automobile Dynamics-A Computer Simulation of General Three-Dimensional Motions", Society of Automotive Engineers Transactions, 1971.
12. "Approximation of Impact Conditions Via Computer Simulation", Paper presented at the NATO Conference on Accident Investigation, Brussels, Belgium, June 28- 29,1973.
13. "A Computer Program for Reconstruction of Highway Accidents", Proceedings of the Seventeenth Stapp Car Crash Conference, Oklahoma City, Oklahoma, November 12- 13, 1973.
14. "A Comparison of Results Obtained With Different Analytical Techniques for Reconstruction of Highway Accidents", Society of Automotive Engineers, International Automobile Engineering and Manufacturing Meeting, Detroit, Michigan, October 13-17, 1975.
15. "The CRASH Program: A Simplified Collision Reconstruction Program", presented at the Motor Vehicle Collision Investigation Symposium, October 6-10, 1975, at Calspan Corporation, Buffalo, New York.
16. " The Astro Spiral Jump-An Automobile Stunt Designed via Simulation", SAE Paper No. 760339, Automotive Engineering Congress & Exposition, Detroit, Michigan, February 23-27, 1976.
17. "Computer Aids for Accident Reconstruction", Society of Automotive Engineers No. 760776. 1976 SAE Automobile Engineering and Manufacturing Meeting, October 18-22, 1976.
18. "A Revised Damage Analysis Procedure for the CRASH Computer Program", SAE Paper No. 861894, Proceedings of the 30th Stapp Car Crash Conference, October 27-29, 1986, Society of Automotive Engineers Transactions, 1986 (with B. G. McHenry).
19. "SMAC-87", SAE Technical Paper No. 880227, International Congress and Exposition, Detroit, Michigan, February 29- March 4, 1988, Society of Automotive Engineers Transactions, 1988 (with B. G. McHenry).
20. "HVOSM-87", SAE Technical Paper No. 880228, International Congress and Exposition, Detroit, Michigan, February 29-March 4, 1988, (with B. G. McHenry).

21. "Effects of Restitution in the Application of Crush Coefficients", SAE Technical Paper No. 970960, 1997 (with B.G. McHenry).
22. "SMAC-97 - Refinement of the Collision Algorithm", SAE Technical Paper No. 970947, 1997 (with B.G. McHenry).
23. "CRASH-97 - Refinement of the Trajectory Solution Procedure", SAE Technical Paper No. 970949, 1997 (with B.G. McHenry).
24. "RICSAC-97 - A Reevaluation of the Reference Set of Full Scale Crash Tests", SAE Technical Paper No. 970961, 1997 (with B. G. McHenry).