



## LARRY A. SICHER, B.S.M.E. PROFESSIONAL BIOGRAPHICAL OUTLINE

### BACKGROUND

Mr. Sicher earned a B.S. in Mechanical Engineering from Pennsylvania State University. He has been employed at ARCCA since 1997 as an engineer working in occupant crash protection. Prior to joining ARCCA, Mr. Sicher was employed at Information Networking Systems as an engineering consultant before spending over five years as an engineer with the U.S. Navy. Many of his projects dealt with the protection of occupants exposed to the crash environment, and ranged from solving detailed structural hardware problems to occupant crash kinematic control. He has extensive experience in designing and testing crashworthy systems, including but not limited to seating and restraint devices, and structural components. While working for the Navy, he was responsible for failure investigations of aircrew pelvic restraints, restraints and components, comfort components, actuation systems, and seat structural elements in naval high-performance aircraft. This work aided aircrew during daily operations, and especially during the emergency ejection sequence.

His work at ARCCA has included conducting and analyzing numerous full-scale dynamic vehicle crash tests, sled tests, inverted drop tests, and rollover tests, as well as various component level quasi-static tests. He was the design lead on ARCCA's new common seating and restraint platform for US Army wheeled vehicles, CCOPS. He has been involved in the investigation of hundreds of vehicular accidents with an emphasis on the performance of the occupant protection systems. Specific investigations have included issues dealing with seat belt retractor torsion bars, seat belt buckles, seat belt webbing, vehicle structures, seat belt anchorage locations and structures, seat and seat back structures and child seats. Mr. Sicher was the program lead on a contract with NIOSH that investigated the strength of various mounting techniques in ambulances as well as co-program manager on an Energy absorbing seating system design with the US Army.

### SUMMARY OF EXPERIENCE

- Tested and analyzed occupant restraints and components, emergency oxygen systems, structural elements of the ejection seat, and survival kits
- Designed, tested, and performed failure analyses
- Maintained and developed instruction, including warnings, and repair procedures for various restraint, seating, egress and oxygen systems
- Participated in numerous ejection tower, horizontal accelerator (sled), windblast, and component test programs
- Carried out structural investigations, research and development, and seating and restraint system evaluations
- Conducted static and dynamic test programs, both in-house and at outside test facilities
- Performed structural analysis, failure investigation, and occupant motion assessments and simulations. Led design of the Common Crashworthy Occupant Protection System (CCOPS) for Army wheeled trucks, which has been patented and is being evaluated by the U.S. Army
- Test engineer on various sled and full vehicle crash tests, as well as full vehicle inverted drop tests and surrogate spit tests

## AREAS OF SPECIALTY

- Restraint Performance (Adult and Child)
- Vehicle Structures and Testing
- Occupant Restraint Systems Research
- Failure Analysis and Testing
- Injury Mechanism and Kinematic Analysis
- Crash Data Analysis

## ACADEMIC BACKGROUND

- B.S. Mechanical Engineering, Pennsylvania State University, University Park, PA, 1991
- Graduate Studies: Numerical Computations; Reliability Engineering, and Probability Theory

## PROFESSIONAL EXPERIENCE

### February 1997 – Present | ARCCA, LLC | Director of Transportation

- Evaluates vehicle structure, seating and restraint systems
- Conducts static and dynamic test programs, both in-house and at outside test facilities
- Performs structural analysis, crash investigation, failure investigations, occupant motion assessment, and computer simulations
- Led design of the Common Crashworthy Occupant Protection System (CCOPS) for Army wheeled trucks, which integrates seating restraint while also supplementing the roof structure during the rollover event. This design has been patented and is being evaluated by the US Army
- Conducted numerous crash and sled test programs to evaluate systems such as automotive seat belts and seat backs, vehicular roof structures and roll cages, and child safety seats
- Led numerous sled tests programs including programs with NIOSH that utilized a simulated ambulance wall structure as well as sled tests that have utilized vehicle bucks
- Conducted and analyzed various full vehicle to vehicle crash test with NIOSH
- Conducted sled tests with NIOSH evaluating various restraint systems during frontal, rear, and side impact scenarios
- Conducts automotive seat belt buckle tests and evaluations
- Participated in research, design, and evaluation testing of various energy absorbing (EA) seats

### February 1996 – February 1997 | Information Network Systems (INS) Inc. | Research and Design Engineer

- Managed the technical data package verification for the Navy's new Aircrew Integrated Recovery, Survival, Armor Vest and Equipment (AIRSAVE) ensemble
- Provided technical support for the Navy's Combat Edge (NCE) effort, which included several unique component testing programs
- Created the AIRSAVE data package verification, which involved obtaining samples from several vendors with limited prior knowledge of the system and comparing the product received to the product required and updating the data package to eliminate the discovered deficiencies
- Developed and reviewed ECP's (engineering change proposals)
- Provided inputs for the technical manual on survival kits

- Prepared test plans for the various NCE components
- Conducted survival kit investigations that determined operational effectiveness, failure modes, and possible design deficiencies to the structural elements of the survival kit and its components

### **May 1991 – February 1996 | Naval Air Warfare Center (NAWC)/Naval Air Development Center (NADC)**

- Served as the Senior Project Engineer on ejection seat survival kits and other crash protection equipment
- Researched, developed, tested and evaluated new and in-service designs
- Performed maintenance engineering on in-service designs
- Designed, tested, structurally analyzed, and updated specifications as required
- Directed the development and evaluation of numerous crew equipment ensembles
- Worked on the new SKU-12/A survival kit for the F-14 and A-6 series aircraft, which gained wide attention for its seamless integration into the fleet with existing models
- Served as the Systems Engineer on the qualification of a newly modified survival kit container for the Canadian Department of Defense
- Oversaw the test planning, fixturing, test dummy requirements, instrumentation requirements, testing, and test reporting for numerous test programs on both the NAWC Warminster Ejection Tower and Horizontal Accelerator
- Supported the structural windblast testing of a new helmet design that incorporated a helmet-mounted cueing system by drafting the test plan, conducting the testing, and participating in the data analysis
- Served as a NAWC liaison at the NAVAIR office
- Was a Project Engineer on escape systems From 1991 to 1994
- Involved in the design and testing of new and in-service ejection seat survival kits and associated components
- Assisted senior engineers in conducting ejection tower, horizontal accelerator, mini-centrifuge, and inversion (rollover) tests
- Assisted in the post-test data analysis (electronic, photographic, high-speed film, and video)
- Conducted human subject testing studies to compare donning, doffing, and egress times on 15 different seat and man-mounted restraint systems on the anthropometric range of Navy aviators in an F/A-18 cockpit

### **PROFESSIONAL AFFILIATIONS**

- American Society of Mechanical Engineers (ASME)
- Society of Automotive Engineers (SAE)

### **PATENTS**

- Seat-mounted Occupant Crash Protection System, U.S. Patent Number 6,155,601
- Dual Stage Variable Load Energy Absorber for Vehicle Seating, U.S. Patent No. 8,162,374B2, April 24, 2012
- Co-inventor of Dual Stage Variable Load Energy Absorber for Vehicle Seating, U.S. Patent No. 8,439,420B2, May 14, 2013.

## PUBLICATIONS

D'Aulerio, Louis, Whitman, Gary, **Sicher, Larry**, Cantor, Alan, Markushewski, Mike. (2018): Forensic Performance Analysis of Load-Limiting Devices in Automotive Seat Belt Retractors, *Journal of Forensic Sciences*, DOI:10.1111/1556-4029.13955.

*\*Chosen by the JFS Associate Editors and Editor-in-Chief as a 2019 Noteworthy Article*

Gary R. Whitman, Dave Scott, Louis D'Aulerio, **Larry Sicher**, Brian Benda, Dennis Shanahan & Alfred Finch (2015): Rollover testing with volunteer live human subject, *International Journal of Crashworthiness*, DOI:10.1080/13588265.2015.1027563.

Harrington, **S., Sicher, L.A.**, Brem, W.J. (2014, September). Lights, Camera, Crash – The Story of a Staged Crash. *Claims Magazine*, 62 (9), 24-28.

Whitman, Gary, **Sicher, Larry**. (2013) *Dual Stage Weight-Variable Energy Absorbers*. Army Research Laboratory. ARL-CR-718.

Whitman, Gary R., Hart, Arlie V., **Sicher, Larry**, Benda, Brian, and D'Aulerio, Louis A. (2013) *Minimizing the Risk of Lap/Shoulder Belted Children Submarining the Lap Belt*. Proceedings of the 23<sup>rd</sup> ESV Conference. May 27-30, 2013.

Whitman, Gary R., Hart, Arlie V., **Sicher, Larry**, Benda, Brian, and D'Aulerio, Louis A. (2013) *Rear-facing Child Safety Seat Performance in Frontal NCAP Level Crashes*. Proceedings of the 23<sup>rd</sup> ESV Conference. May 27-30, 2013.

Whitman, G., D'Aulerio, L., Benda, Brian J., and **Sicher, Larry**. (2012) *Considerations for Optimizing Occupant Protection to Children in Side Impact Crashes*. Proceedings of the ICRASH 2012 Conference. July 18-20, 2012.

Green, J. D., Yannaccone, J.R., Current, S., **Sicher, L.A.**, Moore, P.H., Whitman, G.R., (2010) Assessing the performance of various restraints on ambulance patient compartment workers during crash events. *International Journal of Crashworthiness*, Vol. 15 No. 5.

Whitman, G. R., D.L. Gushue, **L. Sicher**. (2009). *Crash Protection for Infants Transported in Incubators*. (No. 2009-01-2832). Warrendale, PA, Society of Automotive Engineers.

Current, R. S., Moore, P. H., Green, J. D., Yannaccone, J., Whitman, G. R., **Sicher, L.A.** (2007). *Crash Testing of Ambulance Chassis Cab Vehicles* (No. 2007-01-4267). 2007 Transactions. Warrendale, PA, Society of Automotive Engineers.

Joganich, T., **Sicher, L.**, Nicholson, K., Whitman, G., Butch, F. and Nichols, C. (2007). *Human Factors Evaluation of Restraint Systems for Military Vehicles*. Proceedings of the Human Factors and Ergonomics Society, 51st Annual Meeting. October 1-5, Baltimore, Maryland.

Benda, B. J., D'Aulerio, L., Cantor, A., Markushewski, M. L., Probst, B., **Sicher, L.**, et al. (2006). Performance of Automotive Seat Belts During Inverted (-Gz) Rollover Drop Tests. *The Icrash 2006-International Crashworthiness Conference*. Athens, Greece.

Yannaccone, J., Whitman, G., **Sicher, L.**, D'Aulerio, L. (2006). *Analysis of Nij in Simulated Real-World Crashes with a 3-year-old Hybrid-III*. *International Journal of Crashworthiness*, Vol. 11, No. 5.

**Sicher, L.A.**, Whitman, G., & Yannaccone, J. (2006). *Validation of Loading Marks on Child Safety Seats Through Testing* (No. 2006-01-0906). *SAE 2006 World Congress*. Warrendale, PA: Society of Automotive Engineers.

Yannaccone, J., & **Sicher, L.** (2006). *Comparison of Dynamic and Static Web Loop Deployment Forces*. *SAE 2006 World Congress*. Warrendale, PA: Society of Automotive Engineers.

- Whitman, G., **Sicher, L.**, & Yannaccone, J. (2006). *Dolly Rollover Testing of Child Safety Seats* (No. 2006-01-0914). *SAE 2006 World Congress*. Warrendale, PA: Society of Automotive Engineers.
- Yannaccone, J., Whitman, G., **Sicher, L.** (2005). *Pretensioners and Injury Risk*. *2005 Safe Symposium*. Salt Lake City Utah, October 24-26. SAFE.
- Yannaccone, J. R., Cantor, A., Eisentraut, D. K., Denham, W., **Sicher, L.A.** (2005). *Occupant Protection from Cargo in Armored Vehicles* (SAE 2005-01-0879) Selected for inclusion in *SAE Transactions 2005*. *SAE 2005 World Congress*. Detroit, Michigan.
- Yannaccone, J. R., **Sicher, L.A.** et al. (2004). *Development of a Buckle Release Test Procedure* (SAE 2004-01-0472). *SAE 2004 World Congress*. Detroit, Michigan.
- Sicher, L.A.**, Whitman, G. R, et al. (2002). *Lateral Restraint: Comparison of Lap/Shoulder Belt vs. Lap/Shoulder Plus Supplemental Shoulder Belt Restraint Systems*. *SAFE Association's 40th Annual Symposium, SAFE*.
- Whitman, G., **Sicher, L.A.** et al. (2002). *Lateral Crash Restraint for Children*. *SAFE Association, 40th Annual Symposium*. Jacksonville FL, SAFE.
- Whitman, G., D'Aulerio, **Sicher, L.A.**, L.A., Yannaccone, J. R., & Cantor, A. (2002). *Children In Rollover Crashes*. In *Biomedical Engineering: Recent Developments: Medical and Engineering Publishers, Inc.*
- Sicher, L.A.**, Whitman, G. R., et al. (2002). *Lateral Restraint: Comparison of Lap/Shoulder Belt vs. Lap/Shoulder Plus Supplemental Shoulder Belt Restraint Systems*. *SAFE Association's 39th Annual Symposium, SAFE*.
- Whitman, G. R., Yannaccone, J. R., Bendak, F. A., **Sicher, L.**, et al. (2001). *A Method for the Assessment of Tethered and Untethered Child Restraint Systems using Hybrid III Three Year Old Dummy*. *Injury Biomechanics Research, Proceedings of the Twenty Seventh International Workshop*. San Diego, CA, October 24, 1999.
- Sicher, L.**, Yannaccone, J. et al. (2000). *Occupant Protection During Rollover Events*. *SAFE Association 38th Annual Symposium*. Reno, NV.
- Sicher, L.A.**, Whitman, G. R .et al. (2000). *Common Occupant Crash Protection for Army Wheeled Trucks* (SAE 2000-01-1395). Selected for inclusion in *SAE Transactions*. *SAE 2000 World Congress, Society of Automotive Engineers*.
- Reed, J., Whitman, G., **Sicher, L.** et al. (2000). *Designing a More Survivable Seat System: The Test and Evaluation of a Crash Occupant Protection System (COPS) for the HMMWV*. *11th Annual US Army Ground Vehicle Survivability Symposium*. March 27-30.
- ARCCA, Inc. (1998). *Vertical Force Crash Protection for HMMWV Occupants (SBIR Topic No. A97-085)*. Small Business Innovation Research/Department of Defense. Washington, D.C.
- Sicher, L.A.** as Special Project Engineer. (1996). *F-22 ACES II Arm Restraint System and Cockpit Disconnect Ejection Tower Test Report*. NAWCADWAR. U.S. Navy.
- Sicher, L.A.** as Special Project Engineer. (1996) *CT-114 Tutor Ejection Seat Survival Kit Container Ejection Tower Test Report* (NAWCADWAR-95-1-TR). U.S. Navy.
- Sicher, L.A.** as Special Project Engineer. (1996). *CT-114 Tutor Ejection Seat Survival Kit Container Horizontal Accelerator Test* (NAWCADWAR-95-2-TR). U.S. Navy.
- Sicher, L.A.** (1996). *Engineering Investigation on SKU-12/A (F-14 and A-6 series aircraft), Manual Release Handle Stainless Steel Cable Failures*. U.S. Navy.



**Sicher, L.A.** (1994). Mishap Investigation on SKU-3/A (F/A-18A & B aircraft), *Impact Loads During Parachute Landing*. U.S. Navy.

**Sicher, L.A.** (1993). Engineering Investigation on RSSK-8 (A-4 and S-3 series aircraft), *Manual Release Handle Shearing Off During an Ejection*. U.S. Navy.

**Sicher, L.A.** (1992). Engineering Investigation on SKU-2/A (F-14A and A-6 series aircraft), *Crossed Actuation Cables and Possible Reversed Pressure Reducer Toggle*. U.S. Navy.