EXPLICO

NEAL CARTER, MS, PE

Traffic Accident Reconstruction | Forensic Visualization

EDUCATION

UNIVERSITY OF UTAH
- **MS,** Mechanical Engineering, 2007

COLORADO SCHOOL OF MINES
- **BS,** Engineering - Mechanical Specialty, 2004

LICENSES & CERTIFICATIONS

- Professional Engineer, State of Colorado
- Traffic Accident Reconstructionist, Accreditation Commission for Traffic Accident Reconstruction (ACTAR)
- Accident Reconstruction Certificate Program, Society of Automotive Engineers
- Remote Pilot, Small Unmanned Aircraft System Rating, Federal Aviation Administration (FAA)
- Protecting Human Research Participants Online Training Certificate, 2022

AFFILIATIONS

- Society of Automotive Engineers

PROFESSIONAL PROFILE

Neal Carter is a Professional Engineer and Principal Accident Reconstructionist at Explico. Previously, he co-founded Luminous Forensics in 2019, where he was the Vice President and Principal Engineer. Mr. Carter has expertise, experience, and training in accident reconstruction, with an emphasis in pedestrian accident reconstruction, forensic photography, and nighttime or low-light photographs and video. Mr. Carter has conducted testing involving vehicle dynamics and acceleration, nighttime visibility, on-vehicle data recorders, passenger vehicle braking, pedestrian impacts, and motorcycle dynamics, braking, and sliding deceleration. Mr. Carter also regularly publishes technical articles related to vehicular accident reconstruction. Mr. Carter has authored publications based on his testing that have been published by the Society of Automotive Engineers *International Journal of Transportation Safety*, in the Society of Automotive Engineers Technical Paper Series, in *Collision: The International Compendium for Crash Research*, in the *Annals of Biomedical Engineering* and in *Electric Energy*. Topics covered in these articles include vehicle damage analysis methods, vehicle deceleration analysis, event data recorders, simulation, motorcycle crash causation, video analysis, photogrammetry, the use of UAVs for accident reconstruction, motorcycle dynamics, and driver behavior.

Mr. Carter is currently an instructor for the Society of Automotive Engineers course, "Vehicle Crash Reconstruction: Principles and Technology."

AREAS OF EXPERTISE

- Vehicular Accident Construction
- Pedestrian Accident Reconstruction
- Event Data Recorder Analysis
- Nighttime / Low-Light Photography
- Crash Simulation

CONTACT INFORMATION

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EXPERIENCE

- **Explico**
  Principal Engineer — 2022-Present

- **Luminous Forensics, LLC**
  Vice President & Principal Engineer — 2019-2021

- **Kineticorp, LLC**
  Principal Engineer — 2018-2019
  Senior Engineer — 2013-2018
  Engineer — 2007-2013

- **ATK Launch Systems**
  Seals Design Engineer — 2004-2007

AWARDS AND HONORS

- **Excellence in Oral Presentation Award,** Society of Automotive Engineers (SAE), 2019

PEER-REVIEWED PUBLICATIONS

Rose, N., Palmer, J., Smith, C., Carter, N. et al., "Decelerations of Capsized Motorcycles - An Update," SAE Technical Paper 2022-01-0823, 2022, https://doi.org/10.4271/2022-01-0823.

Rose, Nathan A. and Carter, Neal, "An Examination of Equations Relating Motorcycle Impact Speed to Struck Vehicle Post-Impact Rotational Displacement," SAE Int. J. Adv. & Curr. Prac. in Mobility 3(5):2554-2580, 2021, https://doi.org/10.4271/2021-01-0895.

Bailey, Ann, Sherwood, Christopher, Funk, James, Crandall, Jeff, Carter, Neal, Hessel, David, Beier, Stephen, Neale, William, "Characterization of Concussive Events in Professional American Football Using Videogrammetry," Ann Biomed Eng 48, 2678–2690, 2020, https://doi.org/10.1007/s10439-020-02637-3

Rose, Nathan, Carter, Neal, Randolph, Martin, Bortles, William, "Motorcycle Accident Reconstruction: Incorporating EDR Data from the Struck Vehicle," Collision Magazine, Volume 13, Issue 2, 2019.

Carter, Neal, Beier, Stephen, and Cordero, Rheana, "Lateral and Tangential Accelerations of Left Turning Vehicles from Naturalistic Observations," SAE Technical Paper 2019-01-0421, 2019, https://doi.org/10.4271/2019-01-0421.

Carter, Neal, Hashemian, Alireza, McKelvey, Nathan, "An Optimization of Small Unmanned Aerial System (sUAS) Image Based Scanning Techniques for Mapping Accident Sites," SAE Technical Paper 2019-01-0427, 2019, https://doi.org/10.4271/2019-01-0427.

Rose, Nathan A., Carter, Neal, Neale, William T.C., McKelvey, Nathan, "Braking and Swerving Capabilities of Three-Wheeled Motorcycles," SAE Technical Paper 2019-01-0413, 2019.

Rose, Nathan A., Carter, Neal, "An Analytical Review of Two Decades of Research Related to PC-Crash Simulation Software," SAE Technical Paper 2018-01-0523, 2018, https://doi.org/10.4271/2018-01-0523.

Rose, Nathan A., Carter, Neal, and Smith, Connor, "Further Validation of Equations for Motorcycle Lean on a Curve," SAE Int. J. Trans. Safety 6(3):173-191, 2018, https://doi.org/10.4271/2018-01-0529.

Rose, Nathan A., Carter, Neal, Pentecost, David, and Hashemian, Alireza, "Video Analysis of Motorcycle and Rider Dynamics During High-Side Falls," SAE Technical Paper 2017-01-1413, 2017, doi:10.4271/2017-01-1413.

Carter, N., Rose, N., "Validation of Equations for Motorcycle and Rider Lean on a Curve," Impact: The Journal of the Institute of Traffic AccidentInvestigators, 24(1), Fall 2016.

Rose, Nathan A., Carter, Neal, Beauchamp, Gray, "The Accelerations Present During the Trip Phase of a Soil-Tripped Rollover Crash – An Update," Collision: The International Compendium for Crash Research, Fall 2016.

Rose, Nathan A., Carter, Neal, "The Longevity of Scene Evidence from a Rollover – A Case Study," Collision: The International Compendium for Crash Research, Fall 2016.

Rose, Nathan A., Carter, Neal, Kreisher, John, Randolph, Martin, Neale, William T.C., Danaher, David, "How Accurate Are Witness Distance Estimates Given in Car Lengths?" Collision: The International Compendium for Crash Research, Spring 2016.

Rose, Nathan A., Carter, Neal, "The Accelerations Present during the Trip Phase of a Soil-Tripped Rollover Crash," Collision: The International Compendium for Crash Research, Spring 2016.

Carter, Neal, Hashemian, Alireza, Rose, Nathan A., and Neale, William T.C., "Evaluation of the Accuracy of Image Based Scanning as a Basis for Photogrammetric Reconstruction of Physical Evidence," SAE Technical Paper 2016-01-1467, 2016, doi:10.4271/2016-01-1467.

Bortles, William, Biever, Wayne, Carter, Neal, and Smith, Connor, "A Compendium of Passenger Vehicle Event Data Recorder Literature and Analysis of Validation Studies," SAE Technical Paper 2016-01-1497, 2016, doi:10.4271/2016-01-1497.

Rose, Nathan A., Carter, Neal, and Beauchamp, Gray, "Post-Impact Dynamics for Vehicles with a High Yaw Velocity," SAE Technical Paper 2016-01-1470, 2016, doi:10.4271/2016-01-1470.

Carter, Neal, Rose, Nathan A., and Pentecost, David, "Validation of Equations for Motorcycle and Rider Lean on a Curve," SAE Int. J. Trans. Safety 3(2):126-135, 2015, doi:10.4271/2015-01-1422.

Rose, Nathan A., and Carter, Neal, "Further Assessment of the Uncertainty of CRASH3 ΔV and Energy Loss Calculations," SAE Technical Paper 2014-01-0477, 2014, doi:10.4271/2014-01-0477.

Rose, Nathan A., Carter, Neal, and Pentecost, David, "Vehicle Acceleration Modeling in PC-Crash," SAE Technical Paper 2014-01-0464, 2014, doi:10.4271/2014-01-0464.

Rose, Nathan A., Carter, Neal, Pentecost, David, Voitel, Tilo, and Bortles, William, "Using Data from a DriveCam Video Event Recorder to Reconstruct a Vehicle-to-Vehicle Impact," SAE Technical Paper 2013-01-0778, 2013, doi:10.4271/2013-01-0778.

Carter, Neal, Beauchamp, Gray, and Rose, Nathan A., "Comparison of Calculated Speeds for a Yawing and Braking Vehicle to Full-Scale Vehicle Tests," SAE Technical Paper 2012-01-0620, 2012, doi:10.4271/2012-01-0620.

TECHNICAL ARTICLES

Rose, Nathan A., Bortles, William, and Carter, Neal, "Motorcycle Accident Reconstruction: Applicable Error Rates for Struck Vehicle EDR-Reported Delta-V," Collision: The International Compendium for Crash Research, Volume 13, Issue 1, 2019.

Carter, Neal, and Rose, Nathan A., "The Role of Vehicle Crash Data Recorders in a Motor Vehicle Safety Program," Electric Energy, 2015 Issue 2.

Rose, Nathan A., Carter, Neal, and Pentecost, David, "Analysis of Motorcycle and Rider Limits on a Curve," Collision: The International Compendium for Crash Research, Volume 9, Issue 1, Spring 2014.

Rose, Nathan A., Neale, William, and Carter, Neal, "Using Data from a DriveCam Video Event Recorder to Reconstruct a Hard Braking Event," Collision: The International Compendium for Crash Research, Volume 7, Issue 1, Spring 2012.

BOOK CHAPTERS

Carter, Neal, Hashemian, Alireza, Rose, Nathan A., and Neale, William T.C., "Evaluation of the Accuracy of Image Based Scanning as a Basis for Photogrammetric Reconstruction of Physical Evidence," Chapter 9 in Collision Reconstruction Methodologies Volume 1: Collision Documentation, Edited by Chris Armstrong, PT-186_1, SAE International, 2019.

Carter, Neal, Rose, Nathan A., Pentecost, David, "Validation of Equations for Motorcycle and Rider Lean on a Curve," Chapter 9 in Collision Reconstruction Methodologies Volume 4: Motorcycle Accident Reconstruction, Edited by Chris Armstrong, PT-186_4, SAE International, 2019.

Rose, Nathan A., Neal Carter, David Pentecost, Alireza Hashemian, "Video Analysis of Motorcycle and Rider Dynamics During High-Side Falls," Chapter 13 in Collision Reconstruction Methodologies Volume 4: Motorcycle Accident Reconstruction, Edited by Chris Armstrong, PT-186_4, SAE International, 2019.

FUNDED RESEARCH

"Video Analysis of Concussion Causing Events in Professional Football," funded by Biocore LLC, 2016-2017.

"Video Analysis of Concussion Causing Events in Professional Football – A Pilot Study," funded, in part, by the National Football League, 2015.

"Using Data from a DriveCam Video Event Recorder to Reconstruct a Hard Braking Event," funded, in part, by DriveCam - The Driver Science Company, 2011-12.

"Using Data from a DriveCam Event Recorder to Reconstruct a Vehicle-to-Vehicle Impact," funded, in part, by DriveCam - The Driver Science Company, 2012-13.

TECHNICAL PRESENTATIONS AND COURSES TAUGHT

"Vehicle Crash Reconstruction: Principles and Technology," Society of Automotive Engineers Course C1728, 3-day accident reconstruction course taught October 4-6, 2022, Austin, TX.

"Vehicle Crash Reconstruction: Principles and Technology," Society of Automotive Engineers Course C1728, 3-day accident reconstruction course taught May 10 - May 12, 2022, Las Vegas, NV.

"Vehicle Crash Reconstruction: Principles and Technology," Society of Automotive Engineers Course C1728, 3-day accident reconstruction course taught June 15 – 17, 2021, Oxnard, CA.

"Accident Reconstruction – Lidar and Photogrammetry" Chairman for Live Session, WCX Digital Summit, Society of Automotive Engineers, April 14, 2021.

"Forensic Engineering as a Career Path," Society of Women Engineers (SWE), Colorado School of Mines, November 28, 2020.

"Video Analysis, Photogrammetry, and UAVs: The State of the Art," Moderator for Expert Panel Discussion, WCX Digital Summit, Society of Automotive Engineers, June 16, 2020.

"Multimedia and the Modern Juror," Association of Southern California Defense Counsel (ASCDC) 59th Annual Seminar, Presentation and Panel Discussion, Los Angeles, California, January 30, 2020.

"Image Acquisition Techniques and Relative Accuracy: How to Take Great Photos for Pix4D Processing," Pix4D User Conference, Denver, Colorado, October 3, 2019.

"Forensic Mapping of Accident Scenes with Drones and USGS Lidar," State of Washington Torts Division All Staff Meeting, Bremerton, Washington, July 16, 2019.

"An Optimization of Small Unmanned Aerial System (sUAS) Image Based Scanning Techniques for Mapping Accident Sites," Society of Automotive Engineers Technical Paper Presentation, 2019 Society of Automotive Engineers World Congress, Detroit, Michigan, April 11, 2019.

"Lateral and Tangential Accelerations of Left Turning Vehicles from Naturalistic Observations," Society of Automotive Engineers Technical Paper Presentation, 2019 Society of Automotive Engineers World Congress, Detroit, Michigan, April 10, 2019. Mr. Carter received the 2019 SAE Excellence in Oral Presentation Award for this presentation.

"An Analytical Review of Two Decades of Research Related to PC-Crash Simulation Software," Society of Automotive Engineers Technical Paper Presentation, 2018 Society of Automotive Engineers World Congress, Detroit, Michigan, April 10, 2018.

"Further Validation of Equations for Motorcycle Lean on a Curve," Society of Automotive Engineers Technical Paper Presentation, 2018 Society of Automotive Engineers World Congress, Detroit, Michigan, April 10, 2018.

"How Accurate are Witness Distance Estimates Given in Car Lengths?" California Department of Transportation 2016 Tort Conference, Folsom, California, May 20, 2016.

"Evaluation of the Accuracy of Image Based Scanning as a Basis for Photogrammetric Reconstruction of Physical Evidence", Society of Automotive Engineers Technical Paper Presentation, 2016 Society of Automotive Engineers World Congress, Detroit, Michigan, April 13, 2016.

"Driver Distraction and its Associated Risk", RMEL Safety Roundtable, Fort Collins, Colorado, November 14, 2014.

"Accident Investigation and Reconstruction: Techniques to Determine the Root Cause", RMEL Safety and Technical Training Conference, Lone Tree, Colorado, April 23, 2014.

"The Reliability of Crash-Triggered Video and Data Recorders for Accident Reconstruction", 2013 ARC-CSI Crash Conference, Las Vegas, Nevada, May 14, 2013.

"Using Data from a DriveCam Video Event Recorder to Reconstruct a Vehicle-to-Vehicle Impact", Society of Automotive Engineers Technical Paper Presentation, 2013 Society of Automotive Engineers World Congress, Detroit, Michigan, April 17, 2013.

"Comparison of Calculated Speeds for a Yawing and Braking Vehicle to Full-Scale Vehicle Tests", Society of Automotive Engineers Technical Paper Presentation, 2012 Society of Automotive Engineers World Congress, Detroit, Michigan, April 25, 2012.

"Development, Evaluation, and Qualification of Low-Temperature Seal Materials for RSRM Use", 2006 NASA Seal/Secondary Air Flow System Workshop, Cleveland, Ohio.

TECHNICAL CONFERENCES, TRAININGS, AND SEMINARS

"Rear End Crashes with IDRR," Crash Safety Solutions, June 14-June 15, 2022, Webinar.

"Accident Reconstruction Digital Summit," Society of Automotive Engineers, Webinar, March 29-30, 2022.

"International Forensic Photography Symposium," ai2–3D Forensics, virtual symposium, January 17-20, 2022.

"Photography for Accident Reconstruction, Product Liability, and Testing," Society of Automotive Engineers, Oxnard, CA, August 30 – September 1, 2021.

"Factors that Influence Nighttime Recognition," webinar presented by Dr. Jeffrey Muttart, January 27, 2021.

"Applying Automotive EDR Data to Traffic Crash Reconstruction Learning Assessment," Society of Automotive Engineers, live online course, April 27 – May 4, 2020.

"Path Intrusion Reaction Time Studies," webinar presented by Dr. Jeffrey Muttart, March 13, 2020.

"Vehicle Crash Reconstruction: Principles and Technology," Society of Automotive Engineers, Scottsdale, Arizona, February 17-19, 2020.

"Link Right of Way (ROW) Worker Safety Training," online course from King County Metro Rail and Seattle Sound Transit, 1.5 hours, completed July 13, 2019.

"Accident Reconstruction, the Autonomous Vehicle and ADAS," Society of Automotive Engineers, Detroit, Michigan, April 11, 2019.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 9-10, 2019.

"2019 EDR Summit," Collision Publishing Inc, Houston, Texas, March 4-6, 2019.

"Drone Mapping: Ground and Aerial Measurements," Webinar, February 5, 2019.

Pix4D Advanced User Workshop, Pix4D SA, Denver, Colorado, January 31, 2019.

Pix4D User Workshop, Pix4D SA, Denver, Colorado, April 30 - May 1, 2018.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 10-11, 2018.

"2018 EDR Summit," Collision Publishing Inc, Houston, Texas, March 5-7, 2018.

"Photogrammetry and Analysis of Digital Media," Society of Automotive Engineers, Troy, Michigan, December 13-15, 2017.

"Driver's Responses at Curves, Roadside Obstacles, and Intersections," webinar presented by Dr. Jeffrey Muttart, April 17, 2017.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 4-5, 2017.

"2017 EDR Summit," Collision Publishing Inc, Houston, Texas, March 6-8, 2017.

"Introduction to Brake Control Systems e-Seminar," Society of Automotive Engineers, completed December 1, 2016.

"Driver's Responses at Traffic Signals and Intersections," webinar presented by Dr. Jeffrey Muttart, November 16, 2016.

"Persuasive Presentations," Duarte Inc., Online Training, completed October 10, 2016.

"Vehicle Crash Reconstruction Methods," Society of Automotive Engineers, Scottsdale, Arizona, September 28-30, 2016.

"UAS Flight Safety Program," 1UP Aerial Drone Services, Inc., Greenwood Village, Colorado, September 23, 2016.

"Presenting Data and Information," Edward Tufte, Denver, Colorado, July 22, 2016.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 13-14, 2016.

"Applied Vehicle Dynamics," Society of Automotive Engineers, Greer, South Carolina, November 16-18, 2015.

"Flight Ready Boot Camp," Unmanned Experts and Roswell Flight Test Crew, Aurora, Colorado, July 24-26, 2015.

"Initial Qualification Training Course (IQT1) – Small UAS," Unmanned Experts Online Training, completed July 23, 2015.

"Reconstruction and Analysis of Rollover Crashes of Light Vehicles," Society of Automotive Engineers, Detroit, Michigan, April 24, 2015.

"Reconstruction and Analysis of Motorcycle Crashes," Society of Automotive Engineers, Detroit, Michigan, April 23, 2015

"UAS Set to Revolutionize Public Safety," Leica Geosystems, January 14, 2015.

"Accessing and Interpreting Heavy Vehicle Event Data Recorders," Society of Automotive Engineers, Oxnard, California, October 21-24, 2014.

RMEL Safety and Technical Training Conference, Lone Tree, Colorado, April 23, 2014.

2013 ARC-CSI Crash Conference, Las Vegas, Nevada, May 14-15, 2013.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 17-18, 2013.

"Driver Distraction from Electronic Devices: Insights and Implications," Society of Automotive Engineers, April 3 and 5, 2013.

Crash Data Retrieval (CDR) System Analysis and Applications Course, Crash Data Specialists LLC, North Las Vegas, Nevada, March 26-29, 2013.

"Distracted Driving: An Outbreak of Irresponsibility," presented by DriveCam, Inc, March 6, 2013.

"New Features in PC-Crash 9.1," presented by MEA Forensic, February 12, 2013.

Society of Automotive Engineers (SAE) World Congress, Detroit, Michigan, April 25-26, 2012.

"Signal Timing and Operations," University of California, Berkeley, Institute of Transportation Studies, Sacramento, California, February 1-2, 2012.

Motorcycle Safety Foundation® Basic RiderCourse, Aurora, Colorado, September 10-11, 2011.

Expert Topics in PC-Crash Workshop, Orlando, Florida, April 7-8, 2011.

Essentials of PC-Crash Workshop, Orlando, Florida, April 6, 2011.

Bosch Crash Data Retrieval (CDR) System® Level 2 Technician Course, Greenwood Village, Colorado, March 8, 2011.

Bosch Crash Data Retrieval (CDR) System® Level 1 Technician Course, Greenwood Village, Colorado, March 8, 2011.

"Design of Experiments for Engineers," Society of Automotive Engineers, Troy, Michigan, August 5-6, 2010.

2009 VAMPIRE User Day, Chicago, Illinois, October 8, 2009.

"CVSA Out of Service Seminar," Colorado Motor Carriers Association, Denver, Colorado, August 27, 2009.

ME5238 – Impact Mechanics, University of Colorado at Denver, Summer 2009.

VAMPIRE Railway Vehicle Dynamics Simulation Software Training, 1-Week Course Presented by Rail Sciences, Inc., Greenwood Village, Colorado, July 6-10, 2009.

"VBOX Product Training", VBOX USA, Denver, Colorado, April 21, 2008.

"Tire Mechanics & Modeling," Course Presented by Dr. Patrick Fitzhorn, Director of the Race Vehicle Dynamics Laboratory at Colorado State University, Denver, Colorado, March 20, 2008.

2006 NASA Seal/Secondary Air Flow System Workshop, Cleveland, Ohio.