



Exponent®



Transportation

MOBILITY MADE SAFER



Hard Questions. Tough Challenges. Bring It.

In an era of accelerating change, Exponent is the only premium engineering and scientific consulting firm with the depth and breadth of expertise to solve our clients' most profoundly unique, unprecedented, and urgent challenges.

Exponent's 950+ consultants help our clients navigate the increasing complexity of more than a dozen industries, connecting decades of pioneering work in failure analysis to develop solutions for a safer, healthier, more sustainable world.

Exponent by The Numbers

90+

Technical
Disciplines

30+

Offices Across North
America, Europe & Asia

1967

50+ Years of
Scientific Excellence



HOW WE HELP CLIENTS

Moving the Transportation Industry Forward

Exponent's transportation experts actively contribute to the advancement of the industry through original research and our 50+ years' experience analyzing and testing vehicles, vehicle components, and vehicle systems as well as performing reconstructions of real-world incidents.

We offer sophisticated, complex research into safety and performance for all types of vehicles — from planes and trains to self-driving automobiles.

Vehicles

From tires and batteries to novel driver interfaces and driverless safety, our work spans every aspect of modern vehicle design, construction, and operation.

Commercial & Trucking

Commercial vehicles and trucking are transforming as fast — or faster than — daily passenger vehicles. Our experience keeps you current across operational concerns ranging from rapid-response investigation to ADAS applications to fleet-level performance.

Aviation & Aerospace

We made our name reconstructing major airline crashes, forming the foundation of our work today to help prevent them.

Rail

Gone are the days of steam engines and simple iron rails. We provide expertise in infrastructure, electronic systems, and human operators.

Shipping & Maritime

We offer broad experience investigating groundings, collisions, and sinkings, giving us unique insights into how to help mitigate them.

SOLUTIONS

Developing the Solutions of Tomorrow for Implementation Today

The continual evolution of modern transportation systems and vehicles, combined with increasing regulatory, safety, and environmental requirements, places increased demands on transportation innovators as they balance the development and implementation of advanced technologies with regulatory compliance and sound safety practices.

Exponent's multidisciplinary teams assist transportation industry innovators with these challenges through the analysis, testing, and quantification of how emerging technologies perform. Our approach provides unique insights for stakeholders within the vehicle and transportation industries in multiple areas including:

Accident & Failure Investigation

Investigating motor vehicle accidents, air crashes, train derailments, and ship groundings; analyzing automobile and heavy equipment failures, including components, electronic systems, ADAS, and lithium-ion batteries.

Product Analysis & Improvement

Analyzing software integrations; providing novel, highly customizable and repeatable ADAS testing; understanding how people interact with their vehicles.

Product Safety & Recall

Custom testing for hard-to-reproduce failure scenarios; behavioral analysis; statistical modeling of baseline accident rates.

Regulatory & Compliance

Vehicle safety testing; human perception studies; application of new engineering standards.

Technology, Data & Innovation

Quantifying human perception through custom research; validating driverless vehicle technologies; mining accident databases; quantifying injury potential using human body models.



FEATURED CAPABILITIES

Science That Shapes Electric Vehicle Development

Electric vehicles (EVs) exist at the cutting edge of multiple technologies, including batteries, computing, electrical systems, and materials. Exponent brings the cross-disciplinary expertise needed to evaluate them independently and as a system, helping advance their safety, performance, and commercial viability.

We have been evaluating electrical and computer systems in EVs since their introduction. Our multi-disciplinary teams know what to look for and how to get ahead of vulnerabilities that can put your product and reputation at risk.

From ideation to creation to evaluation, Exponent is uniquely positioned to support the full EV product lifecycle. We partner with clients to provide the engineering and scientific support needed to push boundaries on diverse product categories.

Design

Engaging our experts in the design phase can identify vulnerabilities early in the process and help you get ahead of risks.

Prototyping

During prototyping, we investigate foreseeable conditions that your battery systems may experience once they're integrated into your EV designs.

Production

In the production phase, we help our EV clients better understand concerns related to safety, reliability, fires, and issues that could lead to unintended consequences.

Failure Analysis

Our experts investigate the scope and implication of field failures. Does it warrant a recall? Was it a one-off concern? Was it a user misuse or abuse? How likely is it to happen again?





Pushing ADAS-Equipped Vehicles Further

Exponent's multidisciplinary expertise allows us to leverage our state-of-the-art ADAS testing equipment to simulate reproducible crash scenarios at an unparalleled level of efficiency and consistency, supporting our clients in understanding the reliability and performance of their ADAS-equipped vehicles from design through to real-world scenarios and incidents.

Industry-Wide Safety Research

Exponent is actively designing the verification and validation methodologies needed to inform the next generation of automotive innovation and legal inquiry on issues of not only "did it do what we designed it to do in the environments we considered?" but also the additional question of "does it deliver the user experience and capability we intended?" Our experts support government agencies and standards organizations through applied research, and we conduct independent studies and publish in peer-reviewed journals.

Cutting-Edge Testing

Our motor vehicle accident reconstructionists develop and perform bespoke tests to quantify ADAS and driver performance under specific accident conditions and in real-world driving situations. Our ADAS-related testing capabilities include the following:

- State-of-the-art robotic vehicle control
- Programmable AB Dynamics™ Global Vehicle Target (GVT)
- Programmable AB Dynamics™ Global Soft Target (GST)
- Full suite of programmable AB Dynamics™ Vulnerable Road User (VRU) targets



Hit the Road at Exponent's Test & Engineering Center

For over 50 years, Exponent has led the industry in full-scale, instrumented vehicle dynamics and collision testing at our Test and Engineering Center (TEC) in Phoenix, Arizona.

Our 147-acre facility features a two-mile vehicle test track purpose-built for the automotive industry, where we conduct statistical analysis of real-world performance data, analyze individual incidents, and perform field, bench, and laboratory tests. Our customized approach provides clients with rigorous, relevant comparisons, performance evaluations, and definitive answers about specific vehicle applications.





SERVICES

Crash Investigation. Technology Adoption. Advanced Testing and Engineering Support.

Exponent's multidisciplinary staff provides design analysis; manufacturing process reviews; product and real-world testing; accident, injury, and failure investigative services; and operational, performance, health, and environmental evaluations for manufacturers, suppliers, operators, insurers, attorneys, and individuals. Our services include:

Crash Investigation

Looking back at a crash is about preparing for the future. How will we keep tomorrow's passengers and operators safe? What can we improve in the engineering or safety procedures that will meaningfully reduce risk?

There's rarely a single fix for a transportation disaster. More often, there are cascading failures to learn from. An old part didn't get replaced on schedule. An indicator light burned out. There were gaps in operator training. Unusual conditions exposed a design flaw.

Exponent specializes in systems thinking, working in cross-disciplinary teams to ensure all angles are investigated and any solutions are comprehensive. Most importantly, we make sure all recommendations are accurate, detailed, and actionable.

Human Performance

People — whether pilots, drivers, passengers, or crew — are an integral aspect of transportation. No risk mitigation or accident investigation is complete without examining the human angle. Our human factors and biomechanics experts draw on their deep knowledge to answer key questions impacting transportation safety:

- How can vehicle controls be designed to help operators avoid mistakes?
- How do stress, fatigue, and other psychological states contribute to accidents?
- How can protections like seatbelts and airbags be designed for maximum effectiveness?
- What signs and warnings can help passengers survive and escape from an emergency?

Materials Performance

The quest to improve performance and efficiency is often a quest to reduce weight. How can we use the least material possible to do a job? As transportation engineers innovate with new materials and designs, it can be hard to know just how safe new approaches are.

Our engineers are expert at helping design teams understand with great precision and accuracy whether their choices are meeting standards of safety. With decades of real-world experience studying the use of metals, plastics, ceramics, and other materials in transportation, we can provide trustworthy assessments backed by data.

Our state-of-the-art labs and crash test facilities allow us to customize testing to truly evaluate your designs.

Technology Advancement

Technology continues playing a greater role in controlling vehicles. We investigate both the present-day performance and future evolution of these systems, such as ADAS for collision warning and mitigation, autonomous features, and connected vehicle technology.

Our consultants are involved in the testing and analysis of these systems both during development and when equipped vehicles are involved in accidents. Exponent is well-versed in:

- Vehicle engineering and testing
- Regulatory analysis
- Human factors
- Data analytics
- Safety-critical control systems
- Sensors
- Software, artificial intelligence, and machine learning
- Cybersecurity
- Electronic power and communications systems



SERVICES (CONTINUED)

Regulatory & Compliance

We provide regulatory support for manufacturers and transportation systems operators, and have appeared on behalf of clients in front of regulatory bodies such as:

- National Highway Traffic Safety Administration (NHTSA)
- National Transportation Safety Board (NTSB)
- Consumer Product Safety Commission (CPSC)
- Environmental Protection Agency (EPA)

We bring fact-based analyses that help you clear regulatory hurdles, whether you are trying to launch a new product or resume operations after an incident.

Additionally, our manufacturing safety experts can help minimize the risk of health or safety issues in your production operations. Meeting Occupational Safety and Health Administration (OSHA) requirements is just a starting point. Exponent specializes in looking across your infrastructure and processes to understand and mitigate the risks posed by machines and humans alike.

Environmental & Health

Manufacturing cars, planes, trains, and ships involves many hazardous chemicals that can put workers and the nearby environment at risk. Likewise, the passengers in your vehicles may be exposed to hazardous fumes from plastics or fabrics.

Our multidisciplinary scientific and engineering teams can give you a clear understanding of how your manufacturing activities may affect the surrounding air, soil, and groundwater. We also can help identify and mitigate issues with the air quality within vehicles.

Sustainability

In the big picture, we help you understand the impact of climate change on your business, now and in the future. How will your customer needs change? How might regulations evolve? How can your operations prepare for weather extremes?



Warranty & Recall Support

We address product safety risks, including design, manufacturing, distribution, and consumer use issues, to inform critical business decisions. Our cutting-edge, customized testing services can help diagnose a wide variety of failure modes related to recalls and warranty claims.

We also provide sophisticated statistical analysis of warranty data, providing the evidence-based insights needed to evaluate specific problems, identify root causes, and support vehicle manufacturers in making informed choices such as whether to continue production, pursue potential design changes, or implement corrective measures to mitigate future risks and help ensure consumer safety.

Disputes

Clients turn to Exponent when they need to objectively understand what went wrong and why. Whether you're dealing with a performance contract dispute or a wrongful death suit, Exponent brings principled science to the task — telling you what you need to know and providing answers to complex questions.

Exponent knows transportation inside and out. Our consultants represent objective, scientific analysis at dispute proceedings by bringing clarity, precision, and a knack for explaining complicated topics in understandable ways to non-technical audiences. We assist clients across all phases of disputes.





TESTING & EVALUATIONS

Examining Every Angle

Our experts have worked hand-in-hand for decades with the major automakers, aircraft companies, and other stakeholders, tailoring our tests and evaluations to their specific challenges. Whether in our state-of-the-art facilities or on-site at an accident, our testing and evaluations capabilities deliver answers.

Transportation Evaluations

We help quantify product performance, analyze system & component failures, and address claims.

Structural Crashworthiness

Studying vehicles at a fundamental level to improve their response to extreme physical impacts.

Restraints and Protections

Providing biomechanical data to improve seatbelt and airbag systems.

Wheels, Tires & Brakes

Guiding improvements in the handling and stopping power of vehicles to avoid crashes in the first place.

Glass & Glazings

Analyzing the safety characteristics of glass and plastic compounds.

Vehicle Controls and Displays

Helping align controls with human perception and physical capabilities, based on deep user research.

Advanced Automation

Fostering innovation in sensors and systems to assist or automate driving.



Outsmart Your Toughest Challenges.

When you're stuck, when you're facing a never-before-seen issue, when everything's on the line, turn to Exponent.

Our consultants thrive on solving unstructured problems, leveraging multidisciplinary expertise and state-of-the-art testing so you can move ahead with confidence. Bring us your tough, your complex, your impossible challenges — and reap the advantages of 50+ years of data-backed industry insights and failure analysis learnings.

We're with you all the way.

GET IN TOUCH

INFO@EXPONENT.COM | EXPONENT.COM

What can we help you solve?

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Exponent[®]

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