

# PLASTICS MAKE CARS SAFER

*“Few innovations provide a more wide-ranging performance and efficiency advantage than reducing weight. All factors of a vehicle’s capabilities - acceleration, handling, braking, safety, efficiency - can improve through the use of advanced lighter materials.”*

*- Ford Motor Company*

## Plastics & Composites Improve Auto Safety

**Composites are considered the new turning point of material science.** That’s why automakers are incorporating polymer composites (and other plastics) into our cars and trucks to improve performance, fuel efficiency... and safety.

Lighter weight fiber-reinforced polymer composites can absorb 4X the crush energy of steel (NHTSA) while polypropylene and polyurethane foams and other polymer composites provide additional impact protection.

“Multilayer composite laminates absorb more energy than conventional single-layer steel, enabling high-end automotive engineers to reduce vehicle weight by as much as 60% while enhancing crash safety... Composite materials’ high strength-to-weight ratio, corrosion resistance and other benefits are driving their increasing use in automotive applications.”<sup>1</sup>

### *Plastics Contribute to American Affordability at the Pump*

These advanced, lightweight materials **improve the safety of occupants** while also **boosting affordability by saving Americans money at the gas pump**. DOE: “A 10% reduction in vehicle weight can result in a 6% – 8% fuel economy improvement.”

## F1 Driver Walks Away from Fiery Crash

**An extraordinary example:** In 2020, F1 driver Romain Grosjean crashed into a steel wall at 150 miles per hour. He walked away from the fiery crash due to four safety enhancements made with plastics:

- The carbon fiber-reinforced plastic safety cell, or “tub”, that drivers sit in.
- The Kevlar (plastic) tether of the “HANS” (Head and Neck Support) device that anchors the driver’s helmet to the headrest.
- The titanium and carbon fiber-reinforced plastic “halo” that deflects objects in a crash.
- The “Nomex” race suit made with heat-and-fire-resistant plastic fibers.

**Safety advances that begin on the racetrack often make their way into the family car.**

## Autonomous Vehicle Safety Rely on Plastics

Plastics enable autonomous vehicles (AVs) by making their complex electronic brains work reliably and safely.

AVs rely on an array of embedded sensors, including cameras, radars and satellite receptors, all of which are made with plastics. For example, light detection and ranging (LIDAR), along with video detection and ranging (VIDAR) – which work similarly to radar but use infrared light or advanced imaging technology instead of sound – are critical as they help the car navigate and avoid collisions. Plastics also encapsulate and insulate these technologies from radio interference, humidity, dust and temperature changes to keep them operating safely, which helps keep occupants safe.

## Crash Tests Demonstrate Improved Safety in Modern Cars (Enabled by Plastics)

Crash test videos demonstrate the improved occupant safety in modern cars. In older steel-heavy cars, the crash dummy gets pummeled because the steel transfers the crash energy to the occupant. In new cars, plastic components absorb lots of crash energy to help protect the occupant. Contemporary cars are designed to take more of the beating from the crash instead of the occupant.

## Auto Safety Advances Are Enabled by Plastics

- **Seat belts:** The use of seat belts (lap and shoulder belts) – which are typically made from polyester – reduces the risk of front seat passenger deaths by 45% in passenger cars. Seat belts saved nearly 15,000 lives in 2017 (NHTSA).
- **Air bags:** Air bags – which are commonly made from high-strength nylon fabric – are credited with saving 50,457 lives in the period from 1987 to 2017 (NHTSA).
- **Child restraints:** Made with tough, engineered plastics, child safety seats and boosters have saved thousands of lives (NHTSA).
- **Brake pads and linings.**
- **Energy absorbing bumpers.**
- **Crumple zones** that help protect pedestrians and occupants.
- **Safety glass** (plastic film sandwiched by glass that helps prevent shattering and protects occupants in a crash).
- **Foam dash boards, door panels and pillars.**
- **Fuel tanks** (reduced fire risk).
- **Housings, wiring and cables** that prevent overheating.
- **Backup cameras.**
- **Sensors** for lane changing, blind-spots, antilock brakes, rain, tire pressure, parking assistance, adaptive cruise control and more that use radar and lidar.
- **Windshield wipers.**
- **Automatic Emergency Braking (AEB):** Required on all passenger cars/SUVs/light trucks by September 2029, NHTSA projects that AEB systems (made with high performance plastics that enable and protect components) will “save at least 360 lives, prevent at least 24,000 injuries, and save more than \$5 billion each year in property damages” annually.