



Safety Issues

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Description

A discussion of the safety issues and related theories encountered in the design of ultra-lightweight vehicles.

Body

The goal of reducing the mass to 400kg has generated a debate over safety concerns when building a lightweight car. A car that is relatively light always has a disadvantage in collisions with larger cars in that it will always experience the greater acceleration. Traditional automobile safety considerations have resulted in designs of very heavy and stiff vehicles, protecting the driver and passengers in a collision but at the same time constituting a hazard for other road users in lighter vehicles because of their significantly reduced stiffness and mass. In addition, heavier vehicles are not as fuel efficient.

Recent developments in automobile safety have led to the increasing use of passive safety systems. Passive safety systems try to minimize the damage and injuries when an accident happens, active safety systems help prevent accidents. such as airbags and active systems like Anti-lock Braking System and night vision enhancements. Designing in the conventional way means that safety systems are included as much as economically feasible. In a car of 400 kg or less it is very difficult to include extensive active and passive safety systems, so the design of a lightweight car

necessitates a reconsideration of the ideas of what constitutes adequate car safety. Is it a car that performs well in crash tests, or is it a car that helps the driver to brake suddenly to avoid a crash? For example Anti-lock Braking System (ABS) and brake assistance.

There is a theory within safety science that states that people have a target risk that guides their behavior, and this is called risk homeostasis. People will try to keep the perceived risk at the same level. A driver that feels safe and protected by her car will speed more. This could lead to accidents with higher speeds involved and therefore more injuries and damage. The same driver would probably not speed in a subcompact, as she will probably feel more vulnerable. Therefore, there might be good arguments to build a car with less active and passive safety systems. The Delft student designers have chosen to design a car with few systems, good handling, but one that makes the driver feel a bit vulnerable. This choice is inspired by the lightweight criterion and the risk homeostasis theory.

Notes

Questions and comments about this case can be directed to [Missy Cummings](#), Massachusetts Institute of Technology or [Anke van Gorp](#), Delft University of Technology.

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Resource Type

Case Study / Scenario