Online Ethics Center
FOR ENGINEERING AND SCIENCE

Comparison of Answers to Safety Questions

Author(s)

Anke van Gorp
Missy Cummings

Description

Comparison of answers from students at Delft University of Technology and the University of Virginia concerning the safety questions posed in the case study "Ethical Issues in the Design of Ultra-Lightweight Vehicles."

Body

The following answers to the safety questions were given by students at two different universities. Note that the answers presented are representative answers, and not inclusive of all students' responses.

Question 1: Are the fundamental responsibilities of safety engineers compromised in the design of this lightweight car?

Answers from the University of Virginia:

- The fundamental responsibility of a safety engineer is compromised by the design of this lightweight car. If you specify that a case should be designed so that it is light as possible regardless of safety concerns, then a safety engineer has to essentially dream up reasons why the car he is designing is safe, i.e. risk homeostasis theory, instead of actually implementing safety devices.

- The fundamental responsibilities of safety engineers are not compromised in the design of this car. By merely designing this car, a safety engineer has not compromised him/herself because there is still no conclusive evidence that the car is unsafe.
- The design of this lightweight car without the standard passive and active safety systems is a definite compromise of the fundamental responsibilities of safety engineers. The general public relies upon these individuals to make sure that a safe reliable product is put on the market, yet for this car that is not the case.
- I do not believe the fundamental responsibilities of safety engineers are necessarily compromised by this project. The safety criteria applied to the design of the car are merely different, or non-conventional. If this car design were to be implemented in the United States, this may pose more of a problem. Since the car is to be applied to Europe, where car designs in general are smaller, more compact vehicles, the lack of active safety features is not as big of a concern.

Answers from the Delft University of Technology:

- Yes. The fundamental responsibility of a safety engineer is to provide a safe car. This safety does not depend only on the driver's abilities and risk homeostasis, nut on other drivers as well. Thus, a safe car not only protects a driver from his/her own mistakes but also from other driver's mistakes.
- It depends on what is meant by "the responsibilities of the safety engineer". In my opinion this responsibility consists of two parts: 1) try to design a car in a way that prevents accidents from happening, 2) try to protect passengers and drivers when accidents do occur. By designing a car in which people feel vulnerable the designers have taken 1) into account. By emphasizing energy use, 2) will probably get less attention.
- Yes because drivers of lightweight cars might drive more safely but other drivers will not do that.
- Whether or not the responsibilities of the safety engineer are compromised depends on the consequences. When the total amount of accidents decreases because people indeed feel vulnerable and drive more safely, then the engineer's responsibility is not compromised.
- The government should formulate the safety requirements, not the engineers themselves.

Question 2: Risk and cost benefit analysis are critical components of any engineering process. Describe the ethical issues that a designer of a lightweight car faces when conducting these analysis.

Answers from the University of Virginia:

- The major ethical difficulty in conducting a cost-benefit analysis where human life is at stake is that one can sometimes find oneself in the moral gray area of putting a price on human lives.
- The best guideline is to rationally ask oneself if they would use the product or let their family, and friends use the product.
- The most significant ethical dilemma that the designers must face is whether it is acceptable to make a car lighter in order to reduce cost despite the fact that this would increase the risk of danger for its passengers.
- The designer of lightweight cars would want to take into account the following: change in probability of fatalities due to the lighter nature of the automobile, savings in cost/consumption of raw materials, change in energy costs of the lifecycle of a car, size and growth potential of target market.

Answers from the Delft University of Technology:

- The ethical issue faced here is the direct relation between costs and risks. In most cases, reducing the risk of serious injuries due to an accident will raise costs. An ethically justified equilibrium between risks and costs has to be found, which is probably one of the hardest challenges in car design.
- The essence of a lightweight car is its weight and usually cost. These are difficult to combine with safety. Both weight and costs give restrictions to the opportunities for the use of safety systems. If there are no lightweight alternatives to conventional safety systems an engineer will have to decide his/her own safety limits. This decision is an ethical problem.
- A cheap unsafe product will cost a company customers and an expensive safe product will not be sold.
- The tradeoffs are:
    - lightweight versus safety
    - lightweight versus costs
    - lightweight versus recycling

    - fuel efficiency versus safety

Question 3: If the theory of risk homeostasis is correct (there are debates about this, some studies indicate that the theory is empirically verified and others claim that the theory is empirically refuted), is it ethical to design cars for perceived levels of risk? Why or why not?

Answers from the University of Virginia:

- I do not think that it is ethical to design the lightweight car for perceived levels of risk. The car may be safe on the road alone, but with other heavy cars on the road, the lightweight car can be in major danger. This risk of compromising safety because of the theory of risk homeostasis is just not ethical.
- You don't want to cater the design of the vehicle to those drivers engaging in risk homeostasis because it will adversely affect those drivers who don't engage in risk homeostasis.
- Relying on questionable risk homeostasis theory for car design is unethical in my opinion…The safer drivers produced by homeostasis theory also do not take into account other drivers hitting these safe drivers with their heavier cars, where the heavier car occupants are more likely to survive.
- In designing cars that have a specific level of perceived risk, engineers are building cars that take into account human behavior. This is not only ethical, but responsible engineering.
- Assuming that the theory of homeostasis is correct, it is still unethical to design cars for perceived risk levels…the driver of a lightweight car would have no way of surviving, because his one and only defense was his perception, and he cannot perceive the negligence of others.
- Yes it would be ethical to design cars for perceived levels of risk, as long as the designers do not try to hide the vulnerabilities of the cars from the public. There are no ethical implications of offering a product as long as the full details of that product are disclosed.

Answers from the Delft University of Technology:

- I do believe it is an ethically justifiable choice if the theory is correct, because the absolute number of accidents will decrease. I have more problems with

SUV's and other large cars that compromise the safety of the rest of the road: they are very dangerous for other cars and invite dangerous behavior at the same time. Of course there is a limit to the nonsafety (sic) policy. I do not believe it is ethical to produce a car with the safety level of a motorcycle and call it a car.
- It is not ethical because drivers of conventional cars do not have the same perceived levels of risk as drivers of lightweight cars. The risk of the second group (drivers in lightweight cars) increases because the risk level of the first group sets the standard.
- No, when an accident does happen, people in the lightweight car are less protected then people in regular cars. Without extra safety systems, people in lightweight cars have less chance to survive an accident.
- No, it might be possible to achieve a higher level of safety at the cost of just a small increase of weight.
- No, the perceived level of risk is subjective. A car company [should] not be allowed to design on subjective levels of risk because this might be biased.
- Yes, it is ethical when the consumer is informed that he/she will not only feel more vulnerable but is more vulnerable in an accident. This is comparable to driving motorcycles.

Question 4: Should lightweight cars be required to meet the same government safety regulations as regular cars? Why or why not? Is the government obligated to introduce any new legislation regarding the manufacturing of lightweight cars?

Answers from the University of Virginia:

- The lightweight cars should be required to meet all of the safety and design standards previously set forth by laws and regulations. However, buyers may be provided [an] incentive to buy the Eco-friendly cars with tax breaks, gas rebates, etc. New legislation will be required to incorporate the new design into the transportation infrastructure. This may be in the form of lowering existing speed limits or setting insurance rates for the lightweight case (i.e. putting control on rates if insurers fear an increased liability for less-safe and unproven vehicles)
- If lightweight cars are going to be driven on the same roadways as normal cars, then the lightweight cars should meet government automobile standards.

- Lightweight cars should not be required to meet the same government safety regulations as regular cars, providing that the lightweight cars are endangering others on the road. At no time did we as a society give the power to the government to administer a set of safety values on us as individual citizens.
- I think the government should be responsible for setting minimum safety test requirements for lightweight cars, although these do not necessarily have to be the same as those for regular cars. Additionally, the government should be obligated to inform potential drivers of lightweight cars of the risks associated with the use of such vehicles.
- Motorcycles do not meet the same requirements as regular cars and lightweight cars may deserve their own distinction.

Answers from the Delft University of Technology:

- Following the previous answers I think this is required. Lightweight cars need to meet the same requirements as stated in present regulations for cars. The passengers should have comparable chances of surviving an accident. I think that the government should promote and subsidize the manufacturing of lightweight cars but also ensure that these cars meet safety requirements.
- Lightweight cars should not be required to meet existing safety regulations as safety of lightweight cars is based on a totally different concept. As with motorcycles a different set of safety regulations should be developed for lightweight cars.
- Yes they should comply with the same regulations because they are part of the same roads and traffic. They ride with the same speed and therefore should be able to withstand the same impact forces.
- The drivers and passengers in lightweight cars should have the same chance of surviving an accident as drivers and passengers in regular cars.
- No, they should not have to comply with the same regulations because lightweight cars are a completely new category of road user. Lightweight cars are like motorcycles based on a different concept.
- The regulations should be slightly adapted so those lightweight cars that comply with a certain minimum level of safety can participate in traffic.

Question 5: If some cars are significantly more safe than others, are engineers violating any ethical standards in designing cars that are not as safe as they could be? What

other factors come into play in addition to ethical considerations when designing for safety?

Answers from the University of Virginia:

- Engineers are not violating any ethical standards by designing "unsafe" automobiles provided that the safety successes and failures are disclosed to the customers at the time of purchase.
- One ethical consideration is whether or not people of all income levels have the option of choosing a risk level acceptable to them, or whether those of scarce means are relegated to driving cars with higher inherent safety risks.
- No. The engineers are not forcing anyone to drive unsafe cars, they are just enabling people to decide how much value their own safety...I believe that it would be unethical to only create cars that are as safe as possible as that would not grant less wealthy people the opportunity to own cars.
- Engineers of the lightweight car are violating ethical standards concerning the safety in the design of these cars. In addition, these engineers are leaving their companies in a vulnerable situation. If the cars are produced in the United States, one thing can be assured, lawsuits will be filed against these companies for the lack of safety features.

Answers from the Delft University of Technology:

- Engineers do not violate any ethical standards when designing a car that is less safe as technologically possible as long as the car complies with safety regulations. Compromises always have to be made and preserving nature and natural resources for future generations is also important.
- Engineers do not violate ethical standards when designing a car that is less safe than it could be provided that: 1) the car meets the governmental safety regulations and 2) this is mentioned to potential buyers.
- There are two forms of safety, safety for people in the car and safety for people outside the car. In crash tests people outside the car are not considered. Design needs to be optimized for both.
- The consumer must be able to choose between different cars. The consumer can therefore choose between the different trade-offs that are made in the different cars. The consumer should have the information to make this choice.

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