

## **Public Health, Safety, and Welfare—Driverless/Autonomous Vehicle**

Case No. 16-5

### **Facts:**

Engineer A is a professional engineer working as a consultant to an automobile manufacturer that is considering the development of a driverless/autonomous vehicle operating system. Engineer A is assigned to an engineering risk assessment team whose members are being asked to make a recommendation relating to potential situations that could arise in connection with the operation of driverless/autonomous vehicles. The following scenario is among the situations that are being considered by the engineering risk assessment team: In the event of an unavoidable crash, does the vehicle's system choose the outcome that will likely result in the greatest potential for safety for the vehicle's passengers or does the vehicle's software system instead choose an option in which the least amount of potential harm is done to any of those involved in an accident, such as having the car crash into a stationary object (e.g., telephone pole, etc.) with the probability of causing some passengers serious but non-life-threatening injuries instead of striking and potentially causing a fatal injury to a pedestrian, cyclist, or motorcycle rider?

### **Question:**

What are Engineer A's ethical obligations?

### **NSPE Code of Ethics References:**

- Section I.1. - Engineers, in the fulfillment of their professional duties, shall hold paramount the safety, health, and welfare of the public.*
- Section II.1. - Engineers shall hold paramount the safety, health, and welfare of the public.*
- Section II.1.b. - Engineers shall approve only those engineering documents that are in conformity with applicable standards.*
- Section II.3.b. - Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.*
- Section III.1.b. - Engineers shall advise their clients or employers when they believe a project will not be successful.*

### **NSPE BER Case Reference: 96-4**

### **Discussion:**

Over the years, the NSPE Board of Ethical Review has sought to examine and address emerging engineering issues and their ethical implications and consequences. New engineering breakthroughs frequently introduce different ways of thinking about engineering ethics.

One example of this was BER Case 96-4, which involved software design testing. In that case, Engineer A was employed by a software company and was involved in the design of specialized software in connection with the operations of facilities affecting the public health and safety (i.e.,

nuclear, air quality control, water quality control). As part of the design of a particular software system, Engineer A conducted extensive testing. Although the tests demonstrated that the software was safe to use under existing standards, Engineer A was aware of new draft standards that were about to be released by a standard setting organization—standards that the newly designed software might not meet. Testing was extremely costly and the company’s clients were eager to move forward. The software company was eager to satisfy its clients; but, at the same time, management wanted to be sure that the software was safe to use. A series of tests proposed by Engineer A would likely result in a decision whether to move forward with the use of the software. The tests were expensive and would delay the use of the software for at least six months, which would put the client company at a competitive disadvantage and cost it a significant amount of money. Also, delaying implementation would mean the state’s public service commission utility rates would rise significantly during this time. The software company requested Engineer A’s recommendation on the need for additional testing.

In deciding that Engineer A had a professional obligation under the Code of Ethics to explain why additional testing was required and to recommend to his company that it be undertaken, the Board noted that if he did so, the company could make an informed decision about the need for additional testing and its effects on the public health, safety, and welfare. The Board of Ethical Review noted that Engineer A needed to balance a variety of factors. According to the Board, Engineer A generally believed that the software designed by his company was safe, but he had become aware of a new testing procedure that was likely to demonstrate results that might cast a cloud over the software’s viability. The financial pressures that existed, including the financial impact on his company, the client, and the public, as well as the potential loss of jobs and delays if additional testing were to be pursued, were clearly important factors and needed to be addressed in some manner. However, said the Board of Ethical Review, it would seem that these nontechnical considerations were factors that needed to be given weight separate and apart from the decision as to whether the additional testing should be recommended by Engineer A. The Board noted that Engineer A would be well advised to prepare a technical report explaining the current testing analysis and results, as well as referencing the new testing procedure that had been recently reported in the professional literature, so that the engineer’s employer could make an informed decision regarding additional testing (see Code Sections III.6.b. and II.4.a.). The industries using the software—water, air, and nuclear—clearly have an enormous impact on the public health, safety, and welfare, and therefore, Engineer A needed to be certain that the information imparted to his employer and to the employer’s clients was clear, accurate, and direct. Engineer A was in a strong position to assist his employer, and ultimately his employer’s client, in carefully evaluating all of the appropriate facts and circumstances in order to take a course of action.

Although the facts in the present case are somewhat different than those in Case 96-4, the Board of Ethical Review believes that several points discussed in the previous case are pertinent to the case at hand. New technologies often introduce new uncertainties and sometimes significant risk. The overriding ethical responsibility of a professional engineer is to hold paramount the safety, health, and welfare of the public. In BER Case 96-4, Engineer A’s ethical concerns in the

case were not related directly to the safety of the software, but instead to the availability of a new draft safety testing standard that might require additional scrutiny of the software. According to the Board of Ethical Review, Engineer A's ethical obligations in Case 96-4 involved balancing a variety of ethical and other business considerations and making a recommendation based solely on technical finding (and not business considerations) to permit the company to make an informed decision about the need for additional testing in furtherance of the public health, safety, and welfare. Implicit in Case 96-4 is the notion that in seeking to fulfill one's ethical obligations, engineers should strive to do no harm in the performance of their professional services.

Similarly, in the present case, Engineer A has a responsibility to fully and actively participate as a member of the engineering risk management team, clearly and unambiguously express any and all concerns he has regarding the safety of the proposed autonomous vehicle operation system, and explore additional potential technical options that could mitigate the risks identified in the proposed autonomous vehicle operating system. In light of the fact that engineers should strive to seek to do no harm in the performance of their professional services, if necessary, Engineer A should propose that further study be undertaken by the company before the autonomous vehicle operating system is utilized.

**Conclusion:**

Engineer A has a responsibility to fully and actively participate as a member of the engineering risk management team, clearly and unambiguously express any and all concerns he has regarding the safety of the proposed autonomous vehicle operation system, and explore additional potential technical options that could mitigate the risks identified in the proposed system. In light of the fact that engineers should strive to do no harm in the performance of their professional services, if necessary, Engineer A should propose that further study be undertaken by the company before the autonomous vehicle operating system is utilized. That being said, to address the specific question posed in the case, Engineer A has an obligation to state that the prime ethical obligation of the vehicle operation is to minimize harm to affect the least number of persons.

**Board of Ethical Review:**

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