Ethics Case Study 5: Missile Explosion

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Abstract:

Ethics in the engineering and scientific field are manifested through the rules and principles of conduct. In this case, the report dives into the professional ethics followed and/or broken in the case of a Missile Explosion. The case involved multiple servicemen dying at the line of duty due to multiple ethics violations. The movement of the missile in and out of its motor casing caused a tribo-electric charging between the grounded cradle and the ungrounded surface motor casing. The motor turned into an insulator, which combined with the grounded cradle created a capacitor. The separation of the motor and the grounded cradle voltage on the capacitor exceeded the breakdown voltage of the air and a spark was drawn from the casing to the grounded metal antenna. This situation could have been avoided during the creation of the missile if the engineers in charge of the design had followed the IEEE code of ethics. The analysis of the case provides several instances where we encounter military officer negligence, conflict of interest, and inappropriate use of technology and knowledge. The report also discusses alternative solutions to every inappropriate decision taken during the creation of the missile. This case serves as a guide to engineers of possible professional scenarios where one must follow with zero-tolerance the IEEE code of ethics.

Introduction:

The ethics case chosen to be discussed in this paper is case 5 “Missile Explosion" from the EENG 4640 Capstone Senior Design Guidebook. The case is about a group of American servicemen who were killed trying to remove a missile from its packing case. The serviceman had difficulty removing the missile from its cradle due to issues with their hoist causing them to raise and lower the missile multiple times till they were successful. The lifting and lowering of the missile from its cradle created a charge on both the cradle and the missile casing due to friction. Once a charge was placed on the cradle and missile casing, the two parts acted like plates of a capacitor. After finally removing the missile from the case successfully, the voltage between the cradle and casing became greater than the break-down voltage of the air and a spark was created when the missile was moved close to a grounded metal antenna. This caused the fuel to ignite and the missile to explode. This scenario was thought of years before the missile went into production by an engineer who was working on the project. He brought his concerns to both his supervisor and military procurement officer; both recognized the problem but decided to continue development of the missile due to time restraints and the unlikelihood of the problem happening. This case presents multiple ethical and professional issues based on the IEEE code of ethics.

The IEEE code of ethics calls for every engineer to recognize the importance of technologies that affect the quality of life throughout the world and to accept a personal obligation to their profession, its members, and the communities they serve (IEEE Code of Ethics).

Background information:

Much like the given missile explosion case there are lots of occurrences where the ethics of the involved parties are questioned. On January 28, 1986, a faulty design led to the death of seven people on the challenger space rocket. Nasa managers were pressured to launch the challenger for a multitude of reasons, such as to prove the validity of the Space Transportation System’s cost effectiveness. NASA was eager to launch the rocket after multiple delays due to weather and mechanical factors. After two delays of the shuttle, NASA contacted all their contractors to see if there would be any more problems due to weather conditions to which the director at Solid Rocket Motor Project knew there has been a problem with the boosters since 1977. A redesign of the boosters was offered and past trials of shown issues caused by the boosters, and complaints have been made about not following the redesign. Due to the erosion of the casing, new material was ordered but was not readily available because of the manufacture time. Before the launch the issues were presented that cold temperatures would cause issues for the launch, but they were shrugged off because there was no data for lower temperatures than their provided situation. Even with the data to prove that a launch would be dangerous, the warnings were ignored violating multiple codes of ethics. This shows that even if the risk of something catastrophic happening is low it is better to take precautions and a delay to save lives. Multiple ethical violations occurred to provide a successful launch to secure funding for the space project. There was a violation of the first code, to hold paramount, the safety, health, and welfare of the public. This was shown by the lack of care when the risks were presented, and they decided to go ahead with the launch regardless. When they were presented with the data findings about the booster O-ring and how it could be avoided, the criticism was ignored and corrections to the errors were not made which violates ethics code five. Code nine was violated when they decided to go along with the launch even knowing the risk of putting people's lives at risk. Code 10 was violated even though two engineers presented the dangers of the launch to their superiors and help them follow the code of ethics, management did not follow this same pattern and heed the warning for the benefit of a successful space program.

Professional issues:

An engineer's professional obligation should always be upheld to the highest standard with integrity. The engineer should make consistent decisions regarding the safety and welfare of the people who are going to be using or near any of their project/creation/machine. Moreover, the engineer is responsible for acknowledging and correcting any errors encountered in the development process. The engineer and supervisor were unable to withhold their IEEE code of ethics since they continued the development of the missile. Their knowledge of a scenario where there was possible harm should have been enough to redevelop the system and conduct more research on their technology. The military supervisor is also at fault by having conflicting interests on the project. His need for the missile surpassed any safety protocol for the missile development. The military supervisor did not have the safety and welfare of the public as a factor to his decision-making. They failed to identify the impact the scenario presented would have in the future and to whom it would affect. The critical risk of the design was outweighed by the demands of the military supervisor. They have a professional obligation to address all the possible impacts of their design. Finally, neither of them held themselves accountable to their knowledge and findings of the missile design. They were professionally irresponsible in their positions and did not support each other to follow the IEEE code of ethics.

Ethical Issues:

Engineers are held to a certain ethical standard because of technology's limitless impact on the world today. Engineering has immense capabilities to better society by providing basic needs like food, shelter, and water to mass populations but also has similar capabilities to damage the population through means of technological warfare and unethical hacking. The IEEE organization provides 10 ethical standards that are meant to be upheld by every engineer to avoid ethical issues that could affect the quality of life throughout the world. In the mission explosion case, there were multiple instances where IEEE code of ethics were not upheld. The first example is when the military procurement officer and supervisor decided to continue the development of the missile knowing that it may harm their employees. The supervisor recognized that there may be an issue but there is a very small chance of it happening and the officer decided to continue development because he did not want to delay the deployment of the missile. This goes against codes 1 and 9 of IEEE code of ethics. Code 1 states that engineers should “Make decisions consistent with the safety, health, and welfare of the public; and to promptly disclose factors that might endanger the public…”, code 9 reads that engineer should “avoid injuring others, their property, reputation, or employment by false or malicious action”. The officer should have delayed development of the missile to allow the supervisor and engineers to properly assess the potential issue and come up with a solution to avoid the catastrophe that later transpired. Another example of the IEEE codes of ethics not being upheld is when the supervisor and engineer did not take the time to stress how potentially dangerous this issue could be to the officer. The officer is not an engineer which means he is not held to the same standard the engineer and supervisor are. Code 10 states that engineers should “assist colleagues and co-workers in their professional development and to support them in following this code of ethics”. It’s the duty of the engineers to stress the importance of the issue to the officer to make sure he is following the code of ethics.

Conclusion:

If none of the code of ethics were violated, the innocent men that were killed in the missile explosion as well as the people involved in the Challenger space rocket catastrophe would have lived to see another day. These cases show the importance of abiding by these codes and the reasons why they are put in place. In each case, there was pressure to complete the given task to meet a certain deadline in time and this led to the managers being careless and negligent. Whether it is pressure or not, nothing should lead to negligence. As an engineer, you must follow the code of ethics and ensure that the safety and wellbeing of the workers and the public are being considered first and foremost. More problems will be caused by not following these codes and at the end of the day, the deadlines won’t be reached, and companies could possibly be faced with lawsuits instead. It is imperative that enough data is collected, and simulations run to ensure that a task will be completed successfully and safely. It is more important to delay development if there is not enough data to prove that the procedure can be done safely. And if an issue is brought up, it should not be ignored. Lastly, even though not everyone is held to the same standard as engineers, as the engineer you must stress that the code of ethics is to be followed and support one another in their findings and knowledge. By following these ethics codes, this is the only way engineers can positively affect the quality of life around the world.

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