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# The Significance of Morals in Engineering

## Ethics Essay

In many professions, it is important to establish an ethical code governing the behavior of professionals in the field. This is especially true within engineering, as engineering projects require significant technical expertise and are generally used by the general public. As a result, the typical end user of an engineer's design will not have the knowledge necessary to check the engineer's work, and must instead trust that the individual or firm responsible for the design adequately ensured its safety. Within aerospace engineering, these standards are especially important. Designs in the aerospace field frequently carry a great cost in the event of failure, not just monetarily but also in terms of human life.

It is for this reason that both the AIAA and NSPE place regulations on an engineer's relations with the public first in their ethical codes. The first tenant of the AIAA Code of Ethics states "The AIAA member will have proper regard for the safety, health, and welfare of the public in the performance of his professional duties," while the NSPE Code calls for engineers to "hold paramount the safety, health, and welfare of the public." Abiding by these statements is important to maintaining the public's trust in the engineering profession. While the average person may not understand the design process that goes into creating the car they drive or the airplane they are flying on, they continue to use these products on the faith that they were designed with appropriate testing and safety margins. This general lack of knowledge means that an engineer not bound by a code of ethics could cut corners on a design with relative ease, with the public not becoming alarmed unless an abnormally high amount of failures began to occur. When operating in compliance with a code of ethics that emphasizes protection of the public, however, such corner-cutting is not permitted to occur. Engineers are discouraged from engaging in behaviors that put the public at risk, and encouraged to speak out against others who do so. This results in overall higher quality products and increased trust in professionals from the public.

To further ensure the safety of engineering designs, engineers are ethically bound to practice only within their area of expertise. The NSPE Code of Ethics lists this as their second Rule of Practice. Such a rule is especially important in the aerospace engineering field, where engineers often take on a high degree of specialization. Especially in the space systems field, engineers may devote their entire careers to the optimization of a single part or sub-system. In a system like a launch vehicle, millions of parts comprising thousands of diverse sub-systems must all function perfectly for a mission to succeed. It is only logical, then, to expect an engineer who has devoted an entire career to rocket engine turbopumps to know very little about designing payload fairings. Some people outside the engineering field, however, expect any engineer working on a system to have a working understanding of all its parts, regardless of their drastic differences. It is the responsibility of an engineer, therefore, to only speak with authority on their areas of expertise, and to defer discussion outside of that area to the appropriate experts.

Not all aspects of engineering ethics deal directly with the safety of a given design. The third section of AIAA's Code of Ethics states that engineers must "take care that credit for

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professional work is given to those to whom credit is properly due.” This is an ethical responsibility that stems not necessarily from a design safety perspective, but from an intellectual property one. It is very common for engineering designs to build off the work that has come before them. In my own research, I am currently working to replicate the kinematics of Hubert Vykukal’s Ames Experimental Suit 5 in a 3D-printed spacesuit. While the specific designs and manufacturing processes have been developed by our team, the overarching concept and even some specific design aspects of the suit are Vykukal’s. To claim them as our own would not only be inappropriate, it would be theft of Vykukal’s intellectual property.

Preventing plagiarism and theft of intellectual property is just as important, if not more so, in an academic setting as in a professional one. In an academic setting, plagiarism and other forms of academic dishonesty can be especially dangerous, as they can allow unqualified individuals to complete degree programs and enter the workforce. At best, this hurts employers by providing them with improperly trained employees who are unable to complete the tasks they are assigned. At worst, this permits designs created with unsafe and unethical practices to reach the market, placing human life at risk and threatening the reputation of the engineering profession. By following the University’s Code of Academic Integrity, you ensure that both yourself and others in your field truly earn the degrees you are awarded, and are properly prepared for your next steps beyond graduation. Failure to adhere by these policies can have severe consequences, both within the University and beyond. If a student is caught cheating, the punishments are severe, ranging from failure of the course to expulsion from the University. Even a relatively lenient punishment of failing a course without receiving an “XF” can seriously impact a student’s four-year plan, which can in turn result in significant monetary cost. Beyond the University, students who cheat regularly will not be prepared for their careers following graduation. Misrepresenting your qualifications is grounds for termination from nearly all employers, and can make finding a new job difficult as well.

Overall, a reputation, whether that of an individual or their associated institutions or profession, is both incredibly value and incredibly easy to tarnish. By upholding ethical practices in both their professional and academic lives, engineers are able to keep their reputation free from blemishes. This not only serves them professionally, but helps to ensure the safety of the public as a whole.