Isaac Morrison

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The Engineer, Ethics, and Professional Responsibility

STS 4600 – 004

Socio-Technical Synthesis

To complete my fourth-year studies, I have looked into the design processes of spacecraft engineering. My final technical project was a conceptual design review of a CubeSat, which is a small one-foot satellite, to begin the process of a four-year long project that will eventually lead to a launch. It will focus on studying hypersonic flight, or speeds greater than five times the speed of sound. My STS research paper followed the research done in my Prospectus from last semester and went into more detail about the cause behind the Space Shuttle Challenger disaster of 1986. It looked into the different groups of people involved during the design processes which led to the Shuttle's failure. Together, both the Technical Report and the STS Research Paper helped me better understand how the design process works for such a large scale project such as a spacecraft.

This CubeSat mission that I am working on is very important for the space community. Hypersonic flight is required to leave the Earth's atmosphere yet collecting data for such fast speeds is quite difficult. The current wind tunnels are hard to maintain and quite expensive to upkeep. The CubeSat I am working on will allow hypersonic flight to be studied for a relatively cheap cost by even small groups such as an undergraduate student like my team here at the University of Virginia. The conceptual design for the CubeSat has been carefully chosen throughout this academic year and will be continued to be honed by the next few groups of fourth year students.

To further my knowledge in the space industry, I decided to research the NASA Space Shuttle Challenger disaster of 1986. The Space Shuttle exploded on January 28 after initial takeoff and ended up killing all seven members of its crew. The technical failure of the Shuttle was deemed to be two O-rings that were used as seals in the solid rocket booster. However, there were many instances made during the design process that could have stopped this disaster from happening. The engineering contractors that performed tests on the O-rings stated that there were problems but were suppressed by upper management. These managers were felt pressure from NASA that if they stopped the launch then NASA would just find another contractor to replace them. Using the Responsibility ethical framework, I chose to place the final blame on Lawrence Mulloy, the project manager for the Space Shuttle Solid Rocket Booster Program.

The combinations of these projects let me see both sides of the spacecraft design process. My Technical Project showed me the beginning stages of the process and how engineers work out the kinks along the way. The STS Research Paper taught me what can happen if the proper steps are not taken throughout each step of the design process. Without working on the Technical Project, I would not understand the dynamics of the spacecraft world. Without the STS Research Paper, I would not have a clue how the end product of a spacecraft design would look like.