Ethical Analysis Of STS 51-L Accident

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Abstract

Leading up to the Challenger Accident (STS 51-L), the NASA Chain of Command made several key decisions that played a major role in the incident. Ranging from blatant denial of structural failures, to fostering a culture with a deadline focus, NASA Management violated the NSPE Code of Ethics. Their choice to put the rocket launch above Human safety, combined with the repeated neglection of safety concerns up to minutes before launch led to one of the deadliest space disasters the world has known.

Keywords: NASA, Safety, Challenger

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One of the first specific cases of NSPE Ethics Code Violation was the night before launch. After high winds and cold temperatures moved into Florida, NASA began to check with contractors about any possible issues with launching in cold temperatures (4, “ENGINEERING ETHICS The Space Shuttle Challenger Disaster”, n.d.). Alan McDonald, director of the Solid Rocket Motor Project at Morton Thiokol, contacted engineers Robert Ebeling and Roger Boisjoly about cold weather issues. Ebeling and Boisjoly complained to Thiokol about issues with the O-ring erosion, and how management was not supporting the redesign force (4, “ENGINEERING ETHICS The Space Shuttle Challenger Disaster”, n.d.). After verifying the issue by conducting his own observation on the O-Rings, Morton Thiokol went to Huntsville, Alabama, and briefed NASA Management about the issue("OEC -Being Asked to Soften the Urgency of the O-ring Problem", 2010). The response given was to “soften the urgency of the issue” when delivering it to upper management ("OEC -Being Asked to Soften the Urgency of the O-ring Problem", 2010). NASA Management was also informed about the flawed database the tests used (“Space Shuttle Challenger Disaster 1986”, 2019). Management responded by putting pressure upon the Thiokol Chief Engineer, Bob Lund, and Engineer Joe Kilminster, coercing them into going back on their original recommendation to delay the launch (ENGINEERING ETHICS The Space Shuttle Challenger Disaster, n.d). Here, Kilminster and Lund violate the NSPE Ethics Code 1b, by allowing an unsafe design to proceed to launch despite substantial evidence to support another delay (“Code of Ethics | National Society of Professional Engineers,” 2013).

Another example of an NSPE Ethics Code Violation was during the launch. The O-rings on the Space Shuttle had previously only been tested on warm launch dates, and as a result, the rubber on the O-rings could seal as fast as 530 milliseconds on a 75 F launch temperature (Mahal, 2017). However, at a launch temperature of about 20 degrees F, the O-rings took nearly 1.9 seconds to seal up, allowing for hot gasses from the booster to leak into the shuttle (Mahal, 2017). Another cold weather concern was the heat-resistant putty protecting the O-ring. At cold temperatures, the putty stiffens, and doesn't function properly (Mahal, 2017). During the night, temperatures had reached nearly 8 degrees Fahrenheit (6, ENGINEERING ETHICS The Space Shuttle Challenger Disaster, n.d.), and the launch site saw over 7 inches of rain (Mahal, 2017). The Launch site was also doused with water from safety showers and fire hoses, which made Ice formation a major concern. The launch team was concerned that the ice would fall during launch and damage the heat tiles, but these safety concerns were waved away by key NASA engineers and personnel several times during the launch protocol (6, ENGINEERING ETHICS The Space Shuttle Challenger Disaster, n.d.). The NASA Engineers and Upper Management violated the NSPE Code of Ethics Section 1b by allowing the rocket to launch despite knowledge of the Ice formation, the weak O-ring seal, and the putty's heat issues ("Code of Ethics | National Society of Professional Engineers," 2013).

Although there were distinct, clear choices made that lead up to the STS 51-L accident, it is important to look at the overall management structure, and culture present at NASA leading up to the launch. NASA had first been limited by President's Nixon, as cut funding to most NASA divisions besides the Space Shuttle Program ("The Space Shuttle Challenger Disaster A Study in Organizational Ethics", n.d.). Unforseen competition from Europe and Russia, further placed

pressure on NASA to achieve a rapid, steady launch schedule to further establish NASA as a commercial space force. President Reagan added onto the pressure by declaring the Challenger shuttle “fully operational” (“The Space Shuttle Challenger Disaster A Study in Organizational Ethics”, n.d.). Rather than work efficiently and thoroughly implement NASA’s redundant safety program from the Apollo missions, the program became a hinderance, and lost effectiveness in the rush to deploy systems at the launchpad (“The Space Shuttle Challenger Disaster A Study in Organizational Ethics”, n.d.).

Conclusion

There is no singular person, or group at fault for the STS 51-L Accident. Rather, the structure of the NASA Organization at the time of the incident lays more to blame. The STS 51-L Accident was easily preventable, but a toxic management culture, high stakes, and blatant disregard for the engineering codes and safety regulations lead to a series of poor decisions ultimately resulting in the crash. The STS 51-L incident outlined the complexity of the NASA Decision Chain between upper management and subcontractors, and emphasized the importance of ethical engineering in the space industry.

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