

Challenger STS-51L Accident Case Study Report

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Rather than being just a technical accident, the STS-51L Challenger disaster was the result of ethical failures stemming from the engineering decision-making process. Even though the dangerous aspect of spaceflight is inherent, engineers and managers are ethically required to act in a conservative way when credible safety risks are identified. Within this case itself, there were known concerns raised before launch about the Solid Rocket Booster (SRB) O-ring performance at low temperatures, but these were ultimately overridden. This report analyzes the Challenger launch decision by looking into a specific individual who violated the NSPE Code of Ethics, describing the technical details and consequences of that decision, and delving into how clearer maintenance and the following of professional ethical standards could have prevented the disaster that unfolded.

Individuals and Details Involved in the Code of Ethics Violations

Morton Thiokol Employees

On January 27, 1986, engineers at Morton Thiokol presented data that showed that the resilience of the SRB O-rings decreased greatly as the temperature went down and that O-ring erosion had occurred on several previous shuttle flights. Engineers Roger Boisjoly and Allan McDonald emphasized that no shuttle launches had ever occurred at temperatures as low as those forecast for the morning of the STS-51L launch, which were near freezing (Presidential Commission on the Space Shuttle Challenger Accident, 1986). Boisjoly specifically warned that low temperatures could prevent the O-rings from sealing fast enough during ignition, allowing hot combustion gases to escape. Based on this evidence, the engineering team formally recommended that the launch should not go ahead if temperatures were below fifty-three degrees Fahrenheit. Boisjoly further warned that there would be a “catastrophe of the highest order,” with

the mention of humans losing their lives as well. Many NASA officials responded dismissively to this warning, with shuttle program manager Lawrence Mulloy stating, “When do you want me to launch - next April?” which reflected the strong schedule pressure influencing the decision-making process (Berkes, 2012).

Jerald Mason

Jerald Mason was the Senior Vice President for Wasatch Operations at Morton Thiokol. He played a direct role in overriding this engineering recommendation by pressuring the engineers without proper technical evidence to make such a decision. Alongside multiple testimonials to further back such claims, in comparison with other officials sharing similar viewpoints, this made his role in the ethical violation clear and easy to trace, making him the chosen primary example. During a closed discussion between management, Mason instructed the engineers to “put on their management hats,” applying pressure to reconsider their position away from a technical, engineering-based viewpoint (The Space Shuttle Challenger Disaster, n.d.). External factors like scheduling and NASA’s expectations for maintaining the launch timeline then became central factors in the final decision to approve the launch. Following this intervention, Thiokol management approved the launch without any new technical evidence being presented (Presidential Commission on the Space Shuttle Challenger Accident, 1986). This decision marked a clear shift away from engineering judgment and contributed directly to the ethical violations surrounding the Challenger launch decision.

NSPE Code of Ethics Violations

Violation of Fundamental Canon I

The actions of Mason clearly violated Fundamental Canon I of the NSPE Code of Ethics, which requires engineers to “hold paramount the safety, health, and welfare of the public”

(National Society of Professional Engineers [NSPE], 2019). By prioritizing schedule commitments and NASA pressure over safety risks that were unresolved, Mason allowed a launch to proceed under conditions that exceeded the test limits of the SRB joint design. This ethical violation then also had direct consequences from a technical standpoint. Low temperatures reduced the elasticity of the primary and secondary O-rings, preventing them from sealing the joint during ignition. Hot combustion gases also escaped through the joint, which resulted in the external tank being breached and led to structural failure. The vehicle disintegrated seventy-three seconds after liftoff, resulting in the deaths of all seven crew members (National Aeronautics and Space Administration, 1986). This clearly shows a direct connection between the ethical failure and the physical disaster, given the outcome that occurred.

Rules of Practice I

Additional ethical violations also occurred in the communication of risk. The NSPE Rules of Practice state that if an engineer's judgment is overruled under circumstances that endanger life, appropriate authorities must be notified (NSPE, 2019). In the case of Challenger, the strength and amount of opposition from the engineering team and viewpoint were not correctly communicated to higher-level NASA officials. There was then later testimony that essentially revealed that senior decision-makers had thought the Thiokol recommendation was unanimous and did not understand that engineers had actually strongly opposed doing the launch (Presidential Commission on the Space Shuttle Challenger Accident, 1986). This failure prevented informed decision-making and violated the ethical requirement for objective and truthful professional reporting.

Suggested Preventative Measures

In conclusion, the STS-51L Challenger disaster was caused by ethical failures that included overriding engineering judgment, silencing professional dissent and opposition to the launch, and failing to communicate risk honestly. Jerald Mason's decision to pressure engineers into reversing a launch recommendation based on safety violated multiple provisions of the NSPE Code of Ethics and played a direct role in the loss of the Challenger crew. To prevent similar tragedies from occurring, future human spaceflight programs must adopt clear launch authority policies, specifically those that let engineers stop a mission when safety cannot be proven. Other measures include the requirement of independent safety review boards, formal documentation of disagreements among technical opinions, and strict environmental testing limits that cannot be bypassed under any circumstances by management. Ethical decision-making must be treated as just as essential as the reliability of hardware because human life depends on consistent and enforceable ethical standards, especially in engineering systems where safety is vital.

References

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