Engineering Ethics:
A Holistic Analysis of The Boeing 737 MAX Incident

Vanessa Morales

12/14/2025

The two Boeing 737 MAX passenger aircraft crashes following the new design's release in 2017 contain many lessons about engineering and regulatory ethics. In 2018 and 2019, these crashes resulted in the loss of over 300 lives and shook families around the world. Layers of poor decisions, made by engineers, managers, and regulatory bodies came together to cause these catastrophic events. It has been agreed upon by many that the engineering design choices of the 737 MAX were at fault for these crashes. Many questions can be raised about the design process, company culture of Boeing, and rigor of FAA certification.

Pressure from competitors left Boeing striving to keep their spot as an industry giant. The introduction of the Airbus 320neo intensified economic competition, which Boeing CEO Dennis Muilenburg used as a reason to expedite the development of the new 737 model. This, as well as a merger which changed the organizational structure of the company, led to a culture shift that placed more pressure on engineers to produce work quickly. A company culture that contradicts the ASME code of ethics, such as disregarding the safety of consumers, creates a conflict within engineers' personal beliefs. Personal financial needs and fears of termination likely stopped many Boeing employees from pushing back on decisions made by management. When faced with ethical dilemmas such as this, it can be easy for engineers' moral code to be clouded by immediate and personal needs, however safe and high quality work must remain priority.

A new feature in the 737 MAX, a stabilizing software system designed to compensate for the larger engines used in the model, was determined to be the cause of both fatal crashes. As engineers worked quickly to solve the problem of a new center

of gravity, caused by the changing of the engines from the previous 737 model, they decided to implement a tool called the Maneuvering Characteristics Augmentation System (MCAS). This piece of software could push the plane's nose down to prevent stall conditions from occurring, and relied on angle of attack (AOA) sensor data. As Boeing and the FAA advanced the 737 MAX toward production, they limited the testing of the MCAS design, and decided against informing pilots of the new functionality (“The inside story of MCAS”). This calls into question the importance of transparency. Since pilots were unaware of MCAS being implemented in the MAX, they had no idea the new risks involved in operating the plane. This ultimately led to the two crashes, in which it was evident that MCAS produced dangerous flight behavior (“Pilots struggled against Boeing’s 737 MAX control system on doomed Lion Air flight”). It was poor practice for Boeing to move forward with MCAS without completing extensive testing, and concealing its existence points to those involved prioritizing business incentives over aircraft safety. Engineers have a duty to hold paramount safety in all of their work. The timeline of events involving MCAS demonstrate a lack of ethical behavior.

During the development of the Boeing 737 MAX, the FAA used a process of delegation when performing aircraft certifications. It has been shown that certifications relating to MCAS, which were delegated to Boeing, failed to account for the level of risk involved during a software or sensor malfunction (Herkert et al. 7). The FAA’s practice of delegation has since been scrutinized politically, and policies have changed to reflect this. Boeing personnel are no longer allowed to be involved in approvals for the updated 737 MAX design. Self-certification is a practice that muddies the waters of ethical regulatory processes. By allowing Boeing employees, who were already facing intense

pressure by upper management to complete the design process as quickly as possible, to have decision making power in the certification process shows a clear conflict of interest. The role of regulators is to ensure that all products are deemed safe, trustworthy, and within industry standards. Allowing economic incentives to drive this process negates the inherent system of checks and balances that exists within the regulatory body.

The faults in the 737 MAX incident cannot be attributed to a single person, instead this is an example of weak ethical practices snowballing while the design process is passed through many hands. Safety, above all, should remain the top priority in all engineering decisions. Career growth and economic incentive cannot justify the harm that unethical engineering decisions cause.This case serves as an important reminder of the ethical duties engineers have in their careers, and the tragedy that can occur when they are not met.

References

"CODE OF ETHICS OF ENGINEERS." *ASME*.

Herkert, Joseph, et al. "The Boeing 737 MAX: Lessons for Engineering Ethics." *Science and Engineering Ethics*, 2020, https://doi.org/10.1007/s11948-020-00252-y.

"The inside story of MCAS: How Boeing's 737 MAX system gained power and lost safeguards." *The Seattle Times*, 22 June 2019, https://www.seattletimes.com/seattle-news/times-watchdog/the-inside-story-of-mcas-how-boeings-737-max-system-gained-power-and-lost-safeguards/.

"Pilots struggled against Boeing's 737 MAX control system on doomed Lion Air flight." *The Seattle Times*, 27 November 2018, https://www.seattletimes.com/business/boeing-aerospace/black-box-data-reveals-lion-air-pilots-struggle-against-boeings-737-max-flight-control-system/.