The Effects of Unethical Decision-Making in the Aerospace Industry: A Boeing Case Study

A Research Paper submitted to the Department of Engineering and Society

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring 2025

On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Understanding mistakes or accidents that have occurred to real-world companies and professionals in the past is essential in assuring personal and collective success for the future. History is taught in every classroom across the United States, not only to give us a better understanding of how we became who we are today, but also to prevent past mistakes from recurring. Often, mistakes in the engineering profession occur due to those in powerful positions prioritizing greed over safety. This highlights the significance of ethics in business, as a smart, ethical company will inevitably outlast and outperform its competitors.

The aerospace industry is a particularly interesting sector at the current moment, as global interest in space and defense has elevated the profession to a focal point of economic and political attention. For a long time, the push for innovation within aerospace has been intertwined with these factors. A notable example of this is the Space Race of the 1960s. The goal to set foot on the Moon was not driven by some fundamental research or advancement purpose; rather, it was to demonstrate political dominance over the USSR. While this illustrates how politics or economics can effectively foster innovation, these drivers can also lead to unintended negative consequences. The outcome of Donald Trump's administration and its relationship with Elon Musk, the CEO of SpaceX, remains to be seen.

The objective of this study is to research and learn from real-world companies that have prioritized innovation due to political or economic influences over safe, ethical decisions. Only when we understand where these companies made mistakes and the consequences of those decisions can we grow into ethical and successful engineers ourselves. The primary case study that this research paper will analyze is the story of the Boeing company. Due to poor

management and unethical decision-making, one of Americas oldest and most well-known aerospace companies has become one that many simply do not trust anymore.

This paper will explore the oversights and unethical decisions made by the company that propelled them down the path they are on today. Ed Pierson, a Boeing whistleblower and UVA guest speaker, provided valuable insights into the inner workings of the company, particularly how the expedited production of the Boeing 737 Max affected the company's culture and product. The discussions and conclusions of this paper would not have been possible without him.

Undergraduate engineers will gain an understanding of how to succeed as professional engineers after reading this paper. It is crucial that we make ethical decisions not only for the good of ourselves or our company, but for the good of the public. By understanding what has happened to aerospace companies in the past, we can better position ourselves to succeed as professionals in the future.

Methodology

The approach taken to collect data for this study was almost entirely qualitative. As arguments in this paper are built upon case studies, most of the supporting information is gained from researching the decisions made by Boeing executives and their subsequent consequences. Quantitative data is still incorporated into this paper, as it can help examine economic trends, but it can possibly overlook political, opinionated, or other non-intuitive factors and decisions. A combination of these two methods is superior, as a complete picture of the case studies can be painted.

The Boeing Company is the primary focus of this paper. The data collection method used for this case study is the words of one of their ex-employees and whistleblowers, Ed Pierson. Mr. Pierson provided multiple talks at the University of Virginia, which provided an in-depth, personal, and extensive look into the company.

Other data collection methods include analytical paper research, recorded interviews, online research, company websites, and news articles. Mr. Pierson was by far the most effective, abundant, and comprehensive source of information. Describing the cultural shift that he personally started to see as a Senior Production Manager provides this paper with irrefutable information and an unrivalled view of the inner workings of the Boeing company.

While Mr. Pierson did provide some of his personal opinions of the company, the author chose to exclude those opinions and only include the facts and story provided. Combined with information from the other sources described above, analysis and arguments will be created by comparison and statistical analysis. Specifically, economic trends will be compared to when major executive decisions were made within the company. This comparison, along with the in-depth story provided by Mr. Pierson, will create a comprehensive background for developing an argument describing the effect of disregarding ethical decision-making. Consequently, readers will better understand how to succeed as professional engineers in the future.

Case Overview

The 737 Max was a next-generation commercial airline for the Boeing company. The aircraft increased its engine c size, flight efficiency, and passenger capacity. This release was a response to Boeing's primary opponent within the commercial airline industry, Airbus, which

had just launched the Airbus A320neo earlier that year. Although Boeing had historically been more economically successful than Airbus, the release of this aircraft proved to be a real threat to Boeing, as the new Airbus LEAP engines promised a 20% reduction in fuel consumption (Cruz & Dias, 2020).

The rollout of the 737 Max was relatively fast. The company claimed that because this aircraft was similar to previous 737 designs, pilots did not need retraining if they were already flying 737s. However, this new aircraft was not as comparable as the company suggested. The objective of the new design was to enhance efficiency and fuel consumption with each flight. To achieve this, larger engines were developed that could consume greater amounts of air, resulting in higher efficiencies. However, since these engines became quite heavy, they had to be positioned differently on the wings, which altered the plane's aerodynamic characteristics.

To account for this, the company added a state-of-the-art system called the maneuvering characteristics augmentation system (MCAS) to the flight computer. This system used angle of attack sensors to determine the discrepancy between the oncoming air and the aircraft's nose. If this measured angle became unsafe for flight, the system would automatically take control of the aircraft to correct its attitude and prevent a stall (Johnston & Harris, 2019).

The 737 Max had its first commercial flight in May of 2017. On October 29th, 2018, a Lion Air flight in Indonesia crashed thirteen minutes after takeoff, killing all 189 passengers and crew. This remains the deadliest incident involving the Boeing company and is the first accident of the 737 Max. Less than five months after this, on March 10, 2019, another crash occurred in Ethiopia. This four-month-old plane crashed six minutes after takeoff, killing all 157 people onboard. Numerous aerospace authorities worldwide grounded the aircraft in response to this incident, with the US Federal Aviation Administration (FAA) being one of the last to do so.

Federal investigation blamed both events on a faulty MCAS system (Herkert & Borenstein & Miller, 2020).

After a CEO change and a two-year updating process, commercial flights of the Boeing 737 Max continued. However, problems continued to arise in the aircraft. In January of 2024, an Alaskan Airlines flight had a panel blow off its emergency exit in the middle of its flight. No injuries were sustained, but an emergency landing was required. Investigators found that four bolts that were supposed to hold the door panel in place were missing (Associated Press News, 2024). On May 25th, 2024, a Southwest Airlines flight experienced an uncontrollable yawing motion called a "Dutch Roll" an hour after departing from Phoenix. This motion is rare for modern aircraft but can easily become catastrophic if handled incorrectly. According to the FAA, a power control unit (PCU) controlling the rudder was damaged on the plane (Rose, 2024).

There have been more incidents involving the Boeing 737 Max, including those in South Korea and London. A reasonable question one might ask in response to these events is: What happened during the production of these airplanes that led to these accidents? The following inside information would not have been possible without the words of Mr. Ed Pierson.

Mr. Pierson grew up in the Washington, D.C. area, attended the US Naval Academy, and served on active duty in the Navy. In 2008, he was hired at Boeing and worked his way into a Senior Production Manager position at the 737 factory by 2015. By 2017, Pierson began to see major flaws with the production process of the planes. After a denied formal request to halt the production of the 737 Max aircraft, Pierson retired from Boeing in August of 2018 (Pierson, 2022).

While working as the production manager, Pierson saw many warning signs of bad management, engineering, and manufacturing. The first was the pressure from leadership to get planes out of the production facility. Boeing management felt outside pressure from competitors such as Airbus and relayed this pressure to the technicians building the aircraft. From an economic standpoint, this strategy is understandable. The only way to remain profitable is to continue to sell aircraft, and the more aircraft that are built, the more that can be sold. However, impossible deadlines and unavoidable pressure do not yield perfect products, which is crucial in the aerospace industry.

This warning sign leads directly to another one; employees were entirely too overworked while designing and constructing these planes. Pierson recounted a morning when he drove directly past his office on the way to work because he was so exhausted. Employees were required to work tremendous numbers of hours in an attempt to get planes out on time. Prior to deadlines, some employees were required to work every day for four weeks straight. This overwork eventually took a mental toll on their performance, resulting in overlooked mistakes that slipped through the cracks.

Problems did not end there. Management did not allow major shipping delays of the large engines to halt production. As a stand-in, the technicians were told to hang large concrete blocks in place of the engines to balance the plane. While this was supposed to be a temporary fix, nearly every semi-complete plane began to adopt this practice. This was not an effective workaround. These airplanes were designed to be built on a particular path. If the engines were missing, the plane could not be manufactured as it was supposed to be. This leads to a cascading effect of missing parts, delayed manufacturing, and overall chaos.

Communication protocols were also adapted to expedite construction time. Small-group updates were terminated and replaced with large-team meetings consisting of hundreds of employees. Only executives would supply updates during these meetings, leaving no room for additional notes from others. In other words, communication stopped in the facility. Employees began to blame others for mistakes that occurred. Due to this lack of communication between engineers, technicians, and executives, a toxic culture was taking form.

Possibly the most devastating change to the company's protocols was how they checked and inspected their work. Normally, a total of around 15,000 inspections would occur over the production of a 737 Max. These inspections would happen throughout the process, with the plane stopping at every step in production to be signed off by two different employees. When production accelerated in 2017, the executives halted in-process inspections and ordered all inspections to happen at the very end. Although the inspection was supposed to be completed by two different people, Pierson noticed that only one person would sign off twice. Not only were fewer people checking the aircraft for quality assurance, but fewer inspections were also occurring. The Indonesian and Ethiopian aircrafts that crashed had 2,900 and 3,200 inspections removed from their checking process, respectively (Pierson, 2025).

These compounding warning signs and bad decisions from executives resulted in the incidents described at the start of this section. These incidents consequently affected the company's financial situation. Grounding the 737 Max airplanes cost the company an estimated 60 million dollars per day (Cruz & Dias, 2020). As the company lost the public's trust, private orders for the plane diminished as well. A list of total orders by year of the 737 Max can be seen in Table 1 below. Of particular interest is the difference in total orders between 2018 and 2019. The first crash occurred in October of 2018.

Table 1: Boeing 737 Max Orders by Year

Year	Total Quantity Ordered	Percent Change (%)
2016	540	-
201-7	774	+143
2018	824	+106
2019	47	-94.3
2020	112	+238

(Boeing, 2025).

Analysis

The only way to effectively learn from the disasters caused by the Boeing company is to determine the root cause of these problems. How did these catastrophes occur, and what can be done to ensure they do not happen again?

In 2001, Boeing moved its headquarters to Chicago from Seattle. All planes were being built in Seattle, so this change started the physical disconnect between management and engineers. In 2022, the company moved its headquarters even further, to Arlington, Virginia. When the 737 Max project began, executives were so far removed from the physical product that business became more important than engineering.

Economic pressure from Airbus forced Boeing executives to mandate seemingly impossible deadlines within the production facility. The shift towards prioritizing money over safe, ethical engineering caused the many accidents that occurred over the past decade at the Boeing company. The FAA blamed a faulty MCAS system for the catastrophic crashes of the two 737 Max flights. An accident on that scale, however, cannot simply be blamed on one thing. The root cause of those accidents was where executives chose to place value. Engineers were not

making decisions; economists were. For the first time in the history of the company, quantity was being prioritized over quality.

The effect of this was devastating. Employees were overworked, communication slowed, and products were imperfect. The chaotic environment which was the 737 Max manufacturing facility could not develop safe vehicles to fly. As a result, the public lost trust in this staple of American aerospace.

There are many things that could have been done to prevent what was described above. The first thing that the company should have done was halt manufacturing when red flags arose. If executives had done this, they would have quickly seen what was happening in the facility. Chaos was so consistent within the production facility that it was normalized. If the directors and employees had taken a step back, they might have seen what was truly happening.

The company also knowingly underplayed the novelty of the 737 Max and the MCAS system. This allowed pilots to fly these planes without additional flight simulator hours, putting 737 Max aircraft in the sky earlier than what should have been possible. They devalued the importance of consistent aircraft checks and lied on approval forms. These decisions compounded into the accidents presented above and could have been easily avoided had the culture of quality and safety within the organization been different.

Blame cannot only be put on the Boeing executives. The FAA has an ethical responsibility to ensure that every certified plane is truly safe for the public. Members of the administration were not doing their due diligence by allowing Boeing to continue to manufacture under the present conditions and allowing the flight of rushed aircraft. The FAA either did not

notice the glaring issues with the production of the 737 Max or chose to ignore them. Either way, an administration developed to keep the public safe from aviation accidents did not do its job.

The economic effect that these events have had on the company is tremendous. After the first crash in 2018, Boeing sold fewer than 6% of the total number of 737 Max planes than the previous year. The most challenging problem that the company is currently attempting to fix is to regain the public's trust. This is quite a complex problem to fix, as lost trust is exceedingly difficult to recover.

There are some practical solutions that executives can implement to fix this challenging problem. After halting production, reworking the company's culture would be the first step to recovery. The inspection protocols of the Boeing aircraft must be immediately reimplemented. Making safety a priority within manufacturing will create a substantially better product. Organizing small group meetings and interdisciplinary communication will develop a healthy community that can trust one another. Once this culture of trust and safety is built within the company, the quality of the aircraft product will translate.

Prioritizing safety within the aerospace industry is paramount for both ethical and economic reasons. Avoiding ethical practices harms ourselves, our companies, and the public for whom we are designing. Due to the decision-making of Boeing executives, the company will likely never return to the leader of American aerospace engineering that it once was. This case study should serve as an example of how small decisions can compound into massive consequences. Continuing to understand the consequences of unethical decision-making within the aerospace industry is the best way to set ourselves up to succeed as professional engineers.

Conclusion

Why are ethics important in the aerospace industry? After all, economics and politics are what truly drive success in engineering, correct? Through a deep dive into the Boeing case study described above, we have seen that making unethical decisions that prioritize executive greed over public safety can have detrimental effects on the future of a company. Although this is certainly true throughout all industries, it is particularly important in aerospace. If the public does not fully trust that your product will safely transport them from one location to another, they will cease to use it. Trust is not something that is easily recoverable, so this can have cascading effects on your company. Because they lied about planes, overworked employees, rushed 737 production, and abandoned safety protocols, the Boeing company is still working to fight the consequences of the incidents involving the 737 Max today.

There is some good that can be made from these catastrophes. To improve our abilities to succeed as professional engineers, we must learn from past mistakes. By understanding the motivations, decisions, and consequences of this Boeing case study, undergraduate engineers can ensure that we do not commit the same mistakes in the future. We can begin to understand the importance of ethics and safety, which are key to our personal success.

While reading this case study is a significant step, it is crucial to understand that learning about the history of the aerospace profession and its accidents from the past does not stop here. The only way to continually improve our chances of success is to keep reading, watching, and listening to stories from professionals today. There have been numerous deadly, yet preventable, accidents in the history of aerospace. If we ignore these mistakes or attempt to sweep them under the rug, they will inevitably repeat themselves. We must use them to our advantage to facilitate success in the aerospace engineering industry.

Limitations certainly exist in this case study. Most of the information acquired for this case study was from a single source. Although Ed Pierson is a credible one, this study could be more nuanced had other perspectives been acquired. For example, the thoughts and views of Boeing executives at that time could add complexity to the decision-making that was occurring. A technician working on the 737 manufacturing floor would also add an interesting perspective to how the work environment and added pressure felt at the time of expedited production.

Completing the research and writing for this thesis has helped to convince me of the importance of ethical decision-making when I enter the aerospace industry. I feel fortunate to be able to provide this comprehensive view to others who are about to join their respective industries. This case study serves as an example for all engineers, but learning should not end here. Continuing to understand mistakes from the past helps to ensure success, both ethically and economically, for the future.

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