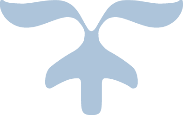


Dreamliner Analysis

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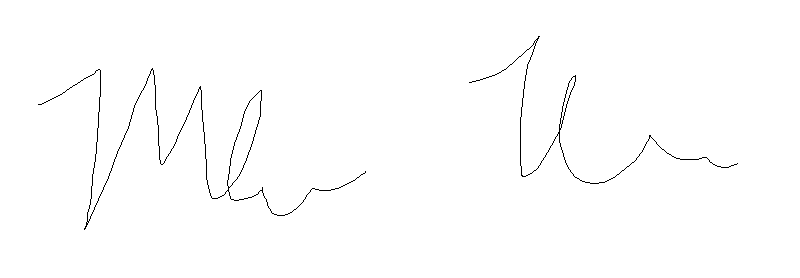
21 June 2023

ENMA 401- Project Management

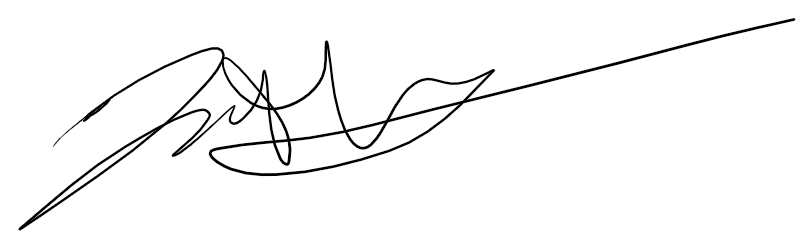
**Honor Pledge**

“Each member of this project pledges to support the Honor System of Old Dominion University. Likewise, each member will refrain from any form of academic dishonesty or deception, such as cheating or plagiarism. As members, we are aware as a member of the academic community, it is our responsibility to turn in all suspected violators of the Honor System. Any member convicted will report to an Honor Council hearing if summoned.”

Merene Victor



Jacob Hightower



Phillip Le



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**Abstract**

The 787 Dreamliner is a revolutionary plane that is Boeing’s most fuel-efficient airliner**.** The Dreamliner had some major problems in the execution of the project. This paper will discuss why the plane was delivered three years after the planned delivery date, issues with sourcing of materials, quality control of those materials, failures in keeping within budget, and what Boeing could have done to prevent these problems from happening. Finally, a look into the future and new direction of Boeing will be mentioned.

**Description**

The Boeing 787 Dreamliner was a breakthrough in commercial airliner capacity and in battery technology. Boeing lost millions of dollars in revenue and profit after missing timelines and numerous other issues. This does not include any of the fines, payouts, and lawsuits filed against them. This also caused airlines to not receive their planes on time and cost them potential revenue. Boeing has had a string of issues recently and this seems to be the beginning of them and certainly wasn't the end. Overall, Boeing completed the Dreamliner over budget and over time.

**Why It Failed**

**Supply Chain/Over-Outsourcing**

Boeing thought to lower the cost of production and accelerate development by outsourcing both locally and internationally. They were looking to reduce the cost by $4 billion and accelerate the timeline by two years; the opposite happened when they went billions of dollars over the budget and finished three years behind schedule. There are many risks to outsourcing, the most important being that the components will not fit together when the plane is assembled. As a result, there was a need for a primary contractor to provide on-site quality inspection, supplier management, and sometimes technical support but Boeing did not plan to provide such support. They instead delegated this responsibility to their subcontractors which led to a decrease in quality control. This led to other issues with the integrity and safety of the plane such as the fires caused by the lithium-ion batteries. Ultimately, the entire aircraft sub-assembly process had to be redesigned which resulted in additional expenses and additional time to complete the construction and delivery of the 787 Dreamliner.

**Lithium Batteries**

On January 7, 2013, a battery on a Japan Airlines Boeing 787 overheated and started a fire; two days later, there was a wiring issue on a United Airlines Boeing 787 in the same area. A flight from Yamaguchi to Tokyo Haneda made an emergency landing after the crew recognized a burning smell in the cockpit which was revealed after further investigation to be a battery fire. The cause of these fires was a lithium-ion battery, which was manufactured by GS Yuasa, that was undergoing thermal runaway. Thermal runaway is a process “in which the heat from a failing cell causes itself and surrounding cells to fail, thereby generating more heat” (Irfan, 2014). On the same day as the battery fire, the Federal Aviation Administration (FAA) stated all Boeing 787 aircraft must be grounded pending further investigation.

**Poor Management**

Given the enormity of this project, the leadership team was expected to be experienced in supply chain management but this was not the case. Since Boeing outsourced the production for the majority of the plane, there were “... more than 50 partners and more than 100 locations” (Feliz, 2022) from where the supply was being provided and assembled. There was a lack of communication between the subcontractors and the suppliers which was the main reason for the many delays in the delivery of the airline. Boeing set up a web-based communication tool called Exostar which was meant to serve as a channel for suppliers to update their progress. “The tool was meant to provide supply chain visibility, improve control and integration of critical business processes, and reduce development time and cost” (Denning, 2013). Although this could have been a great tool for all the suppliers and subcontractors, it did not succeed in that the suppliers did not input accurate and timely information. This was partly due to the cultural differences and lack of trust between the suppliers.

**Stakeholder Management**

The main stakeholders for the 787 Dreamliner project were the suppliers, the customers, and the employees. Boeing had the idea to make the suppliers also be stakeholders of the program to make them share the risk of the program delays. Since they would be risk-sharing partners, they would “bear the up-front non-recurring R&D investment for their work, and wait until the plane is certified and delivered to get paid” (Zhao, 2016). As the suppliers were spending their own money and would be sharing the loss due to delays, Boeing thought that they would be more motivated to work efficiently. This did not work out in their favor because of the lack of communication and trust between the suppliers which instead resulted in more delays.

Boeing also had problems with their employees because of disagreements about pay, pensions, outsourcing, and job security. About 27,000 machinists held a 57-day strike against Boeing which caused even more delays for the first flight and delivery of the Dreamliner. As a result of the delays a lot of the customers who were expecting their 787s demanded cash compensation rather than the discounts Boeing offered to smooth the situation. For example, Air India “announced it was demanding compensation of $480 million for Boeing for delays in the 787 program” (Terdiman, 2011). Ultimately, Boeing had to pay billions of dollars in fees because of the delays with the 787 delivery.

**Thesis**

From the initiation of the 787 Dreamliner project to its closure, Boeing faced many issues with suppliers, production, and management which resulted in the project being set back many years from when the first delivery was promised. Boeing had numerous issues with the wiring, the lithium-ion batteries, and gaps between parts which was a result of outsourcing to various suppliers. The use of a computer-based communication system rather than face-to-face communication between contractors and suppliers shows the poor management that Boeing had for this project. The modes of communication and their effectiveness chart provided below in Figure 1 demonstrates that face-to-face communication is the best way for project teams to share information whereas documentation is fairly low on the chart. Boeing also had poor stakeholder management which resulted in their suppliers, employees, and customers to be dissatisfied and caused even more delays in their delivery of the 787.

All of these problems combined resulted in Boeing having a “total quarterly loss of $4.2 billion” (Chokshi, 2022). The first flight for the Dreamliner was delayed by two years and the first delivery by more than three years.

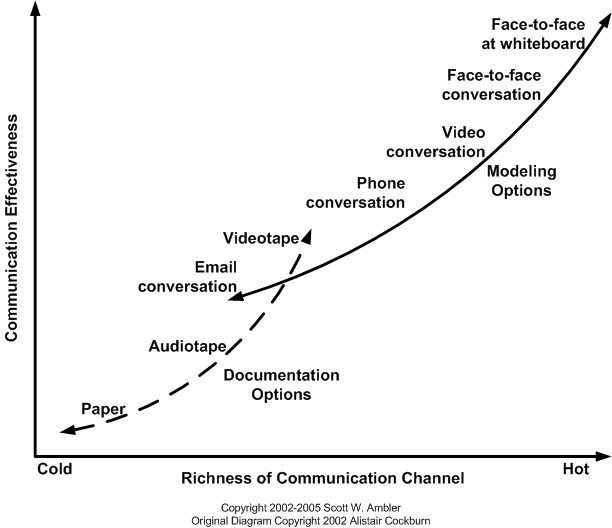


Figure 1. Modes of Communication and Their Effectiveness

**Critical Milestones**

**2002**

* December: Boeing drops its “Sonic Cruiser” concept; much of the composite materials, avionics, and engine technology will be used in the 787 Dreamliner.

**2003**

* January: Boeing assembles a team of executives to design, develop, and market a new plane formally known as the 7E7. The first flight is scheduled for August 2007 and the first delivery is for May 2008.
* March: Boeing seeks proposals for the location of the plane’s assembly and receives 22 bids.
* June: The name “Dreamliner” is selected in Boeing’s “Name Your Plane” competition.
* December: Everett is chosen as the location to build the 7E7.

**2005**

* January: The new plane is dubbed the 787; 8 is good luck in China.

**2006**

* May: Boeing states that some parts supplied internationally won’t be ready when the first 787s are scheduled to come together in two years.

**2007**

* June: A 0.3-inch gap is found in the joint between the nose, the cockpit, and the fuselage section of Dreamliner No.1 which is a result of having multiple suppliers. Boeing states that the first test flight may be delayed until September 2007.
* July: The first 787 is rolled out but the outer structure of the plane is fake in that the wing slats are painted wood.
* October: Boeing admits to a delay of up to six months due to poor management and the first flight is pushed back to March 2008.

**2008**

* January: Another three-month delay is announced due to suppliers and problems with assembly. The first flight was then moved to June 2008 and the first delivery to 2009. This puts the plane 9 months behind the initial schedule.
* April: Another six-month delay is confirmed due to continuing problems with supplies having unfinished work.
* November: A serious problem emerges when 3% of the fasteners were installed incorrectly and must be replaced.
* December: Another six-month delay is announced and Boeing has to reorganize management.

**2009**

* May: Engineers working on the ground-test plane find a structural defect at the wing-body joint but the problem is not made public.
* November: Mechanics fix the wing-body joint, engineers repeat the wing stress test, then the Dreamliner finally gets the green light for its first flight.

**Critical Assessment**

**Past**

While the past mishaps of the Dreamliner and other aviation incidents occurred, there is still reason to travel. After every air disaster, an accident investigation is formed to “improve safety for the future” (Do, 2020). Unfortunately for the company, the Dreamliner had a rough start, as through various stages of its construction, there were accidents, including some that resulted in fatalities. Some famous incidents involved “the crashes of two Boeing 737 Max airplanes less than five months apart, in Indonesia and Ethiopia, that killed 346 people” (Schaper, 2022). Unfortunately, as a result, the “company [entered](https://www.justice.gov/opa/pr/boeing-charged-737-max-fraud-conspiracy-and-agrees-pay-over-25-billion) into a deferred prosecution agreement with the Department of Justice (DOJ), in which Boeing agreed to pay a nearly $244 million fine, to set up a $500-million fund for the families of people who died in the two crashes, and to pay $1.77 billion to airlines that had been affect,” as well as “continue cooperating with the DOJ’s Fraud Section on “any ongoing or future investigations and prosecutions” and is required to report any alleged violation of fraud laws” (Boghani, 2021). Many companies do everything in their power to avoid controversy of any kind, so after these disasters, Boeing had to take public criticism, from all, including blame from the families affected, the media, and even companies that invested in them to deliver results.

**Present**

Today, many manufacturing companies continue taking strides in making their products the best they can be. Boeing failed to deliver on this and was held accountable. While many employees left the company on their own terms or were fired due to poor performance, those that were able to stay did face consequences, either internal or external. Many changes need to occur for present and future planes, including more testing, proper management, and spending more time on training, as well as actually doing the job itself. While the DreamLiner incidents are in the past, employees, engineers, and all staff need to continuously stay current with training on the DreamLiner, so if any repairs need to be made, they can be done in a timely manner. Safety is no exception, but after facing a rough past, the staff needs to do a more in-depth job to prevent any future DreamLiner incidents.

**Future**

Looking to the future, Boeing is seeking new ways to improve the new planes they release. Then- CEO Jim Albaugh mentioned in an interview that Boeing wants to “build enough of everything so we can go and help our suppliers when they get in trouble or we can bring the work inside if necessary” (Karp, 2011). In a way, the company is taking strides to build quality projects, but it does come at a cost. While the cause of the 737 crashes was not related to the environment, Boeing will “focus on incremental improvements for the time being. With the pace at which technology evolves and commitments to sustainability change” (Shlappig, 2022). Sustainability for the environment means future generations can live in a clean environment while making a difference for those that live on Earth. Boeing’s new CEO Dave Calhoun stated in an interview about three years ago that one of his goals involved “Strengthening of Boeing’s engineering culture in line with board recommendations since the two fatal MAX accidents” (Gates, 2020). While it might be too early to tell what direction the company will go in, the CEO is not shy of recognizing the company’s shortcomings, and hoping to find a solution to fix it. In this case, he wants to improve the culture, which can (hopefully) change the future of Boeing, as well as how staff work and interact on a day to day basis.

**Conclusion**

Boeing had and is certain to have its downfalls in the future. Despite the company not exceeding goals, losing the public’s trust, and causing the company to lose money, Boeing rose above their downfalls, working to make great strides to become a leading company in the aviation industry. In fact, last year, the company “is (was) the most valuable and strongest Aerospace and Defence brand in the world, according to a new report from a leading brand valuation consultancy, Brand Finance” (Orban, 2022). Many companies and competitors have a desire to be the best in the industry, it goes to show that despite financial and physical disasters, Boeing is still valued for the company’s products, as well as for the people that work within the company, as well as outside of the company, such as contractors and vendors. While the past can not be erased, the company is looking forward.

Every company needs leadership, but strong companies have strong and dedicated leadership. Boeing has taken the steps not only to find the right CEO, but ensure that he follows newer and stricter regulations. Among his responsibilities, Dave Callhoun and the company have made one of their goals to be that “by the end of 2023 include the safe return to service of 737 MAX-7 and MAX-10 aircraft” (Beresnevicius, 2023). Additionally, project managers assigned to manage the various projects, as well as crew need to hold themselves accountable, as well as those that they manage. Every component of a plane has a function, and if one part of a plane does not function properly, then the whole plane can not function. Not only is it important that the team works together, but the managers work closely with everyone involved. All issues need to be addressed, and done so in a timely manner. It might take time, but it will all be with it at the end.

In conclusion, our group believes that Boeing (and every company) needs to have goals set for their respective futures. If a company wants to survive in an ever changing environment, their goals for the present and future will allow them to assess where they are, as well as what direction they want to go. As such, goals help to hold everyone accountable for their actions, and make sure that nobody is misled, or distracted from achieving their true potential. Goal setting is a crucial part of project management, and effective managers and employees know that successful completion of a project is more than just staying on budget and clear communication. Additionally, goals are important because they reward people for doing good, and provide milestones necessary to finish a project. Finally, goal setting helps prevent employees from feeling exhausted causing poor work performance, and not doing their best, either personally or professionally. Strong project managers need to take the time needed to evaluate their employees and the people they work with. If everyone is able to work together, then a project can be successful, leaving everyone satisfied with what was just produced.

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