

Boeing 737 MAX: A Crisis of Technology, Governance and Trust

1. Evolution of Boeing and the Aviation Industry

1.1 The birth of Boeing

The Boeing Company, established in **1916** by **William E. Boeing**, is a leading global aerospace company and one of the largest exporters in the United States. It develops, manufactures, and services commercial airplanes, defense products, and space systems for customers in more than 150 countries. Boeing is committed to innovation, sustainability, and upholding its core values of safety, quality, and integrity.

With more than a century of aerospace leadership, Boeing continues to expand its products and services to meet evolving customer needs. The company designs and manufactures commercial aircraft, military platforms, defense systems, advanced technology solutions, and provides financing and support services to customers worldwide.

Headquartered in **Arlington, Virginia** (formerly near Washington, D.C.), Boeing employs more than **182,000** people across the United States and over **65 countries**, supported by a global network of suppliers. It also has specialized teams focusing on engineering, program management, technology development, manufacturing, safety, finance, quality improvement, and information technology.

Boeing operates through three business units: **Commercial Airplanes, Defense, Space & Security**, and **Global Services**. Its Commercial Airplanes division is one of the world's leading manufacturers of commercial jetliners, with more than **14,000 Boeing aircraft** currently in service worldwide. Its product portfolio includes the **737 MAX, 777X, 787 Dreamliner**, and industry-leading freighters that serve more than **90% of the global air freight market**.

1.2 Airbus Enters the Market (1970)

Airbus was formed in 1970 as a consortium of French, German, and later British and Spanish aerospace firms, backed by their governments, specifically to break the American duopoly (Boeing, McDonnell Douglas, Lockheed) in commercial aviation. Its first aircraft, the A300, entered service in 1974 as the world's first twin-engine widebody. Airbus's government-backed structure allowed it to absorb early losses while it built a product line, and by the 1980s and 1990s — with aircraft like the A320 (1988), which introduced fly-by-wire controls to commercial aviation — it had become a credible, sometimes technologically ahead, rival to Boeing. This directly eroded Boeing's pricing power and forced it to compete on cost and delivery terms, not just engineering reputation.

1.3 The 1970s Oil Crisis

The global oil crisis of the 1970s significantly increased petroleum prices and exposed the aviation industry's dependence on fuel. According to the U.S. Department of Transportation

(1975), rising fuel costs affected all transportation sectors, with airlines facing increasing pressure to conserve energy and improve operational efficiency.

As fuel prices continued to rise, airlines began prioritizing aircraft with lower operating costs and better fuel efficiency. The Department of Transportation also encouraged the aviation industry to reduce fuel consumption and eliminate operational inefficiencies to remain economically sustainable.

Although this crisis occurred decades before the Boeing 737 MAX, it fundamentally changed airline purchasing priorities. Fuel efficiency became one of the most important competitive factors in commercial aviation, influencing aircraft manufacturers such as Boeing and Airbus to develop more fuel-efficient aircraft in the following decades. This long-term industry shift later contributed to intense competition between the Airbus A320neo and the Boeing 737 MAX.

1.4 Boeing–Airbus Rivalry

The commercial aircraft industry has been dominated by **Boeing and Airbus** since the 1990s, creating a global duopoly in the large jet airliner market. Both companies compete intensely in aircraft innovation, fuel efficiency, safety, pricing, and market share. Their rivalry has driven continuous technological advancements while shaping the global aviation industry. Over the years, other major aircraft manufacturers have either exited the market or shifted their focus, leaving Boeing and Airbus as the two leading competitors.

The competition became more intense with the success of Airbus's **A320neo**, which gained strong customer demand due to its fuel efficiency. In response, Boeing introduced the **737 MAX** to protect its market position and remain competitive. In recent years, Airbus has strengthened its market leadership, surpassing Boeing in revenue in **2019** and operating more aircraft globally than Boeing by **2023**. Although emerging manufacturers such as **COMAC** are entering the market, Boeing and Airbus continue to dominate the global commercial aerospace industry.

1.5 McDonnell Douglas Merger (1997)

In 1997, Boeing merged with McDonnell Douglas after receiving approval from the U.S. Federal Trade Commission (FTC) and the European Commission (EC). According to Boeing, the merger was intended to strengthen the company's long-term competitiveness while benefiting shareholders, customers, suppliers, and employees. To address competition concerns raised by the European Commission, Boeing accepted several conditions, including restrictions on exclusive supplier agreements, commitments to support McDonnell Douglas commercial aircraft customers, and requirements related to patent licensing and annual reporting. Following shareholder approval, the merger officially became effective on 1 August 1997, and the combined company began operating as the new Boeing Company on 4 August 1997.

Although the official objective of the merger was to enhance Boeing's competitive position in the global aerospace industry, later researchers and aviation analysts argued that the merger also influenced Boeing's corporate culture by increasing the emphasis on cost control,

production efficiency, and shareholder value. This perspective is discussed in subsequent academic literature and forms part of the broader analysis of the Boeing 737 MAX crisis.

1.6 Airbus A320neo – A Turning Point

In 2010, Airbus introduced the A320neo (New Engine Option), marking a significant advancement in the commercial aviation industry. The aircraft featured new-generation fuel-efficient engines, aerodynamic Sharklets (wingtip devices), and improved cabin technology, enabling airlines to achieve up to 20% lower fuel consumption, reduced carbon emissions, and lower noise levels compared to previous A320 models. These improvements allowed airlines to reduce operating costs while maintaining high operational efficiency.

The A320neo quickly gained strong market acceptance due to its economic and environmental advantages. Its success significantly increased competitive pressure on Boeing, particularly in the narrow-body aircraft market. Airlines increasingly preferred aircraft that offered better fuel efficiency and lower operating costs, making the A320neo one of Airbus's most successful commercial aircraft programmes.

To respond to this growing competition, Boeing decided to upgrade its existing Boeing 737 platform instead of developing an entirely new aircraft. This decision led to the development of the Boeing 737 MAX, which incorporated larger LEAP-1B engines and the Maneuvering Characteristics Augmentation System (MCAS) to address the aircraft's altered aerodynamic characteristics. This strategic response later became a key factor in the Boeing 737 MAX crisis investigated in this case study.

1.7 Boeing's Strategic Response – Development of the 737 MAX

The **Boeing 737 MAX** is the fourth generation of Boeing's 737 family of narrow-body commercial aircraft, designed to provide greater fuel efficiency, improved performance, and lower operating costs for airlines. Through advanced technology, the aircraft reduces **fuel consumption and carbon dioxide (CO₂) emissions by approximately 20%** compared to previous models. Since its launch, the 737 MAX has received **approximately 7,000 firm orders from more than 100 customers worldwide**, making it one of Boeing's most significant commercial aircraft programs.

The 737 MAX family consists of four variants designed to meet different airline requirements: the **737-7** for expanding new routes and emerging markets, the **737-8** for versatility and operational efficiency, the **737-9** for increased passenger capacity on growing routes, and the **737-10** for high-demand routes with the largest passenger capacity. Today, the 737 MAX remains an important aircraft family in the global commercial aviation industry and plays a significant role in airline operations worldwide.

2.Crisis Background

2.1 Background

In October 2018, Lion Air Flight 610, a Boeing 737 MAX, crashed into the Java Sea shortly after takeoff from Jakarta, killing all 189 people on board. Five months later, in March 2019, Ethiopian Airlines Flight 302, also a Boeing 737 MAX, crashed minutes after takeoff, killing all 157 passengers and crew. Investigations linked both accidents to problems with the aircraft's Maneuvering Characteristics Augmentation System (MCAS), which could force the aircraft's nose downward based on faulty sensor data.

These two similar crashes created a major crisis for Boeing and raised concerns about product safety and corporate responsibility. According to Situational Crisis Communication Theory (SCCT), repeated crises increase stakeholder perceptions of organizational responsibility, especially when the incidents share similar causes. The Boeing 737 MAX accidents provide a clear example of crisis history, where a previous crisis intensified public blame, damaged the company's reputation, and influenced stakeholder responses to the second crisis.

2.2 Time Line

Date	Event
29 October 2018	Lion Air Flight 610 (Boeing 737 MAX) crashed into the Java Sea 13 minutes after takeoff from Jakarta, Indonesia, killing 189 passengers and crew.
Late 2018	Investigations identified concerns with the MCAS anti-stall system, which received faulty sensor data and forced the aircraft's nose downward, making it difficult for pilots to regain control.
10 March 2019	Ethiopian Airlines Flight 302 (Boeing 737 MAX) crashed 6 minutes after takeoff from Addis Ababa, Ethiopia, killing 157 people.
March 2019	The second crash intensified global concerns about the Boeing 737 MAX and increased public and stakeholder blame toward Boeing.
After the Second Crash	The two similar crashes, occurring only 4½ months apart, became an example of crisis history under Situational Crisis Communication Theory (SCCT), where repeated crises increased perceived corporate responsibility and damaged Boeing's reputation. Research Focus Researchers conducted a content analysis of news articles to examine stakeholder responses to both crashes and understand how crisis history influenced blame attribution and crisis communication.

2.3 Lion Air

Lion Air is an Indonesian low-cost airline based in Jakarta. Lion Air is the country's largest privately run airline, the second largest low-cost airline in Southeast Asia (after AirAsia) and the largest airline in Indonesia. With Wings Air, Super Air Jet and Batik Air, Lion Group is the country's largest airline group. The airline operates domestic as well as international routes, which connects different destinations of Indonesia to Singapore, the Philippines, Malaysia,

Thailand, Australia, India, Japan and Saudi Arabia, as well as charter routes to mainland China, Hong Kong, South Korea and Macau, with more than 630 flights per day.

2.4 Ethiopian Airlines

Ethiopian airlines it was founded on 21 December 1945 and commenced operation on 8 April 1946, expanding to international flight in 1951. The firm become a share company in 1965 and changed its name from Ethiopian Air Lines to Ethiopian Airlines. Ethiopian is a star alliance member having joined in December 2011.

2.5 Problem Statement

The Boeing 737 MAX crisis emerged following two fatal accidents involving Lion Air Flight 610 in October 2018 and Ethiopian Airlines Flight 302 in March 2019, which claimed a total of 346 lives. Investigations found that both crashes were primarily caused by the malfunctioning Maneuvering Characteristics Augmentation System (MCAS), which relied on faulty Angle of Attack (AOA) sensor data and repeatedly forced the aircraft's nose downward. In addition to the technical failure, investigations highlighted shortcomings in Boeing's aircraft design, pilot training, safety communication, and regulatory oversight.

The recurrence of two similar crashes within five months created a severe corporate crisis for Boeing, resulting in the worldwide grounding of the Boeing 737 MAX fleet, significant reputational damage, financial losses, and reduced public trust. The crisis demonstrated how inadequate crisis management, insufficient transparency, and repeated safety failures can intensify stakeholder blame and increase organizational responsibility. This case has become a widely recognized example of crisis history in Situational Crisis Communication Theory (SCCT), highlighting the importance of effective crisis communication and proactive risk management in restoring stakeholder confidence.

3.Root Cause Analysis

3.1 Technology Failure

The main technological failure in the Boeing 737 MAX was the Maneuvering Characteristics Augmentation System (MCAS). Boeing introduced this software to improve aircraft stability after installing larger engines that changed the aircraft's flying characteristics.

MCAS relied on information from only one Angle of Attack (AoA) sensor. When this sensor provided incorrect data, the system mistakenly believed the aircraft was about to stall and repeatedly pushed the nose of the aircraft downward. Since the system did not compare data from the second AoA sensor, it could not detect the error.

As a result, a single sensor failure caused MCAS to activate continuously, making it difficult for pilots to regain control of the aircraft. This lack of system redundancy and fault detection became one of the major technological causes of both the Lion Air Flight 610 and Ethiopian Airlines Flight 302 accidents.

3.2 Governance Failure

One of the major corporate governance failures at Boeing was the Board of Directors' inability to provide effective oversight of the company's safety and risk management practices. The board focused more on financial performance and market competitiveness than on ensuring aircraft safety and protecting stakeholders.

Boeing also failed to maintain transparency with regulators, airlines, and pilots. Important information about the MCAS system was not fully disclosed, and concerns raised by engineers and employees were not given sufficient attention. This weakened accountability and reduced stakeholder trust.

As a result, weaknesses in corporate governance contributed to poor decision-making and increased safety risks. The lack of effective board oversight, transparency, and accountability became one of the key organizational causes of the Boeing 737 MAX crisis.

Source - Abdeldayem, M. M., Aldulaimi, S. H., Abu-AlSondos, I. A., & Baqi, A. (2023, May). Corporate governance and sustainability development goals: Boeing case study. In Conference on Sustainability and Cutting-Edge Business Technologies (pp. 354-366). Cham: Springer Nature Switzerland.

3.3 Trust Failure

The Boeing 737 MAX crisis resulted in a significant loss of trust among key stakeholders, including airlines, regulators, investors, passengers, and the general public. Following the two fatal crashes, investigations revealed that Boeing did not fully disclose important information about the MCAS flight control system to pilots and regulators. The repeated safety failures, combined with a lack of transparency and ineffective crisis communication, raised serious concerns about the company's commitment to passenger safety and corporate accountability. As a result, stakeholders increasingly questioned Boeing's credibility and ethical decision-making.

The second crash, occurring only five months after the first, intensified stakeholder blame and further damaged Boeing's reputation. Airlines postponed or cancelled aircraft orders, passengers became reluctant to fly on the 737 MAX, investors lost confidence, and regulators imposed stricter certification and oversight requirements. Boeing was subsequently required to invest heavily in safety improvements, transparency, pilot training, and governance reforms to restore public confidence.

3.4 Engineering Failure

To compete with Airbus's A320neo, Boeing decided to upgrade the existing 737 instead of developing a completely new aircraft. Larger, more fuel-efficient engines were installed on the 737 MAX. Due to the aircraft's low ground clearance, the engines had to be positioned higher and farther forward, changing the aircraft's flight characteristics.

Instead of redesigning the aircraft, Boeing introduced the MCAS software to correct this problem. This helped save time and reduce costs, but it also made the aircraft heavily dependent on the software.

As a result, the engineering decisions increased the aircraft's safety risks. The design changes, together with the heavy reliance on MCAS, became one of the main causes of the Boeing 737 MAX accidents.

3.5 Leadership Failure

One of the major leadership failures at Boeing was the shift from an engineering-focused culture to a business-focused culture. During the leadership of Dennis Muilenburg, the company placed greater emphasis on reducing costs, increasing profits, and competing with Airbus, while safety received less attention.

Senior management also pushed to bring the 737 MAX to the market quickly to maintain Boeing's competitive position. This created pressure on engineers and influenced important decisions during the aircraft's development and certification process.

As a result, leadership decisions prioritized business goals over engineering concerns and safety. These decisions weakened the company's overall decision-making process and contributed to the Boeing 737 MAX crisis.

3.6 Risk Management Failure

Boeing did not properly identify and manage the risks associated with the 737 MAX before it entered service. Although the aircraft introduced new technologies such as MCAS, the company underestimated the possible safety risks and believed that existing procedures were sufficient to manage them.

As concerns about the MCAS system and pilot training emerged, they were not given enough attention. Instead of taking additional safety measures, Boeing continued with its development and certification plans. This meant that several important risks remained unresolved before the aircraft was delivered to airlines.

When the two accidents occurred, it became clear that Boeing's risk management process had failed to identify, assess, and reduce critical safety risks. The company learned that managing risks effectively is essential to protecting passengers, maintaining public trust, and ensuring long-term business success.

3.7 Certification Failure

The certification process of the Boeing 737 MAX had several weaknesses. During the aircraft's development, the Federal Aviation Administration (FAA) relied heavily on Boeing to assess and approve parts of its own design. This reduced independent oversight and allowed important safety issues to go unnoticed.

The investigation found that Boeing did not fully disclose important information about the MCAS system to regulators and pilots. At the same time, the FAA did not thoroughly review the aircraft's design, pilot training requirements, and safety assessments before granting certification.

As a result, the certification process failed to identify critical safety risks before the aircraft entered service. The investigation concluded that stronger regulatory oversight, greater transparency, and a more rigorous certification process could have helped prevent the Boeing 737 MAX accidents.

4. Impact Analysis

4.1 Financial Performance Impact

❖ Revenue analysis

Revenue by Business Segment (US\$ Million)

(Dollars in millions) Years ended December 31, 2019, 2018	2019	2018	2017
Commercial Airplanes	\$32,255	\$57,499	\$54,612
Defense, Space & Security	26,227	26,392	23,938
Global Services	18,468	17,056	14,611
Boeing Capital	244	274	307
Unallocated items, eliminations and other	(635)	(94)	537
Total	\$76,559	\$101,127	\$94,005

Boeing's total revenue decreased by \$24.568 billion in 2019 compared with 2018, mainly due to a significant decline in revenue from the Commercial Airplanes segment. Although Boeing Global Services (BGS) recorded higher revenue, it was not sufficient to offset the overall decline. The reduction was primarily caused by lower 737 MAX aircraft deliveries following the worldwide grounding. In addition, Boeing recognized \$8.259 billion in customer concessions and other compensation related to delivery delays and operational disruptions caused by the 737 MAX grounding, after considering insurance recoveries.

The grounding of the 737 MAX significantly disrupted Boeing's aircraft delivery schedule, preventing the company from recognizing revenue from completed aircraft. As the Commercial Airplanes segment is Boeing's largest source of revenue, the sharp decline in deliveries had a substantial impact on total revenue. Furthermore, the customer compensation and concessions provided to airlines increased the financial burden, further reducing reported revenue during the year.

The decline in revenue demonstrates the significant financial impact of the 737 MAX crisis on Boeing's core business operations. Reduced aircraft deliveries and customer compensation weakened the company's financial performance, limited its ability to generate income, and increased financial pressure. This highlights Boeing's heavy dependence on its commercial aircraft business and shows how operational disruptions can directly affect the company's profitability and long-term financial stability.

❖ Cost of Sales (Commercial airplanes) Analysis

Boeing's cost of sales decreased by \$9.397 billion in 2019 compared with 2018, mainly due to lower revenue and reduced reach-forward losses. However, despite the overall decline in cost of sales, cost of sales as a percentage of revenue increased from 80.6% in 2018 to 94.2% in 2019. This increase was primarily driven by the 737 MAX grounding, which significantly affected the company's revenue generation.

Although Boeing reduced its total cost of sales, revenue declined at a much faster rate because of the suspension of 737 MAX deliveries. As a result, cost of sales represented a larger share of total revenue, reducing the company's gross profitability. The grounding disrupted Boeing's ability to generate revenue while many production-related costs continued, leading to lower operational efficiency.

The increase in cost of sales as a percentage of revenue indicates that Boeing became less efficient in converting its operating costs into revenue during the crisis. This weakened the company's profitability and placed additional pressure on its financial performance. The findings demonstrate that the 737 MAX grounding not only reduced revenue but also increased the relative cost of generating income, highlighting the financial consequences of major operational disruptions.

❖ Profit Analysis

Boeing's operating results moved from a healthy profit in 2018 to a loss in both crisis years, driven almost entirely by the BCA segment.

Metrics(\$ Million)	2018	2019	2020
Segment operating profit/(loss)	12,102	(1,324)	n/a*
BCA segment earnings/(loss)	7,830	(6,657)	(13,847)
Earnings/(loss) from operations	11,987	(1,975)	(12,767)
Net earnings/(loss)	10,460	(636)	(11,941)
Net earnings/(loss) to Boeing shareholders	10,460	(636)	(11,873)
Diluted EPS	\$17.85	\$(1.12)	\$(20.88)

Boeing's Commercial Airplanes segment loss increased from \$6.657 billion in 2019 to \$13.847 billion in 2020. The 2019 loss was mainly caused by the suspension of 737 MAX deliveries and \$8.259 billion in customer compensation. In 2020, losses increased further due to continued 737 MAX costs, the \$6.493 billion 777X reach-forward loss, and lower 787 program margins.

The 737 MAX grounding significantly reduced Boeing's profitability by disrupting aircraft deliveries and increasing compensation and operating costs. Although other programs also affected performance in 2020, the continued impact of the 737 MAX crisis remained a major contributor to the company's losses.

The increasing losses show that the 737 MAX crisis had a long-term financial impact on Boeing. It weakened profitability, increased financial pressure, and slowed the company's recovery over successive years.

❖ Cash Flow Analysis

Net cash used in operating activities was \$2.4 billion in 2019, compared with positive operating cash flows of \$15.3 billion in 2018 and \$13.3 billion in 2017. The decline was mainly caused by the 737 MAX grounding, which resulted in lower earnings, higher inventory levels, reduced advance payments from customers, and \$1.2 billion in customer compensation. Boeing also continued producing aircraft despite suspended deliveries, increasing inventory costs.

The 737 MAX grounding significantly reduced Boeing's operating cash flow by disrupting aircraft deliveries while production and compensation costs continued. As a result, the company generated less cash from its core operations and faced increasing financial pressure.

The decline in operating cash flow weakened Boeing's liquidity and short-term financial stability. It reduced the company's ability to fund operations internally and increased its reliance on external financing during the crisis.

❖ Aircraft Deliveries

Commercial airplane deliveries collapsed as the 737 MAX could not be delivered from mid-March 2019 through year-end 2021 in most jurisdictions (U.S. deliveries resumed in December 2021).

Deliveries (units)	2018	2019	2020	2021
737 (all variants)	580	127	43	387
747	6	7	5	5
767	27	43	30	33
777	48	45	26	24
787	145	158	53	31
Total commercial deliveries	806	380	157	480

Commercial airplane deliveries show the significant impact of the 737 MAX crisis on Boeing's delivery performance. Total commercial deliveries declined from 806 aircraft in 2018 to 380 in 2019, and further to 157 in 2020. The 737 program experienced a similar disruption, with deliveries falling from 580 aircraft in 2018 to 127 in 2019 and only 43 in 2020. This sharp decline reflected the impact of the 737 MAX grounding, which prevented Boeing from delivering completed aircraft and disrupted normal delivery operations.

Following the resumption of 737 MAX deliveries, Boeing began to recover in 2021. Total commercial deliveries increased to 480 aircrafts, while 737 deliveries increased substantially to 387 aircraft. This improvement indicates that Boeing gradually restored its delivery operations following the grounding and regulatory restrictions.

Overall, the 2018–2021 figures demonstrate the progression from normal delivery performance in 2018, to severe disruption during 2019–2020, followed by an initial recovery in 2021. The

figures therefore provide clear evidence of both the operational impact of the 737 MAX crisis and Boeing's early recovery after the aircraft returned to service.

Shareholder Return Analysis

Boeing's total shareholder return index declined from 249.86 in 2019 to 165.17 in 2020, representing a decrease of approximately 34%. During the same period, both the S&P 500 Index and the S&P 500 Aerospace & Defense Index performed better, reflecting the prolonged impact of the 737 MAX grounding on Boeing's market performance.

The prolonged 737 MAX grounding reduced investor confidence in Boeing, leading to a significant decline in shareholder returns. While the broader market and industry remained relatively stable, Boeing's performance weakened due to the ongoing financial and operational effects of the crisis.

The decline in shareholder returns indicates that the 737 MAX crisis negatively affected investor confidence and Boeing's market value. This reduced shareholder wealth and highlighted the long-term financial consequences of the crisis.

❖ Risk Factors

Boeing identified several risks arising from the 737 MAX grounding, including delays in regulatory approval, production and delivery disruptions, increased customer compensation, higher supplier costs, legal proceedings, and government investigations. The company also reported rising debt levels, credit rating downgrades, and potential difficulties in obtaining additional financing due to the financial impact of the crisis.

The 737 MAX grounding exposed Boeing to significant operational, financial, legal, and regulatory risks. Increased borrowing, legal uncertainties, and supply chain disruptions placed additional pressure on the company's financial position and slowed its recovery.

These risk factors demonstrate that the 737 MAX crisis affected more than Boeing's operations. It weakened the company's financial stability, increased financing costs, and created long-term uncertainty, making effective risk management essential for restoring business performance and stakeholder confidence.

❖ Investor Response

The 737 MAX grounding had a significant impact on investor confidence and capital market activities. Boeing suspended its share repurchase program despite having \$17.3 billion remaining under authorization at the end of 2019. Share repurchases declined from \$9.0 billion in 2018 to \$2.7 billion in 2019 and were completely suspended in 2020. In addition, the Board suspended dividend payments in March 2020 to preserve liquidity during the crisis.

The suspension of share repurchases, and dividend payments reflects Boeing's efforts to conserve cash and strengthen its liquidity during the 737 MAX crisis. These actions indicate that the company prioritized financial stability over returning value to shareholders.

The reduction in capital returns weakened investor confidence and reduced shareholder value in the short term. However, preserving cash helped Boeing manage the financial impact of the crisis and maintain its ability to support ongoing operations and recovery efforts.

❖ **Credit Rating**

Boeing's credit ratings were downgraded following the 737 MAX grounding due to increasing liquidity pressures and higher debt levels. The 2019 Annual Report warned that further liquidity requirements could lead to additional credit rating downgrades. In 2020, major credit rating agencies downgraded both Boeing's short-term and long-term credit ratings, mainly because of the company's rising debt balance.

The 737 MAX crisis weakened Boeing's financial position, forcing the company to increase borrowing to manage liquidity. As debt levels increased, credit rating agencies viewed Boeing as a higher-risk borrower, resulting in multiple credit rating downgrades.

The downgrade in Boeing's credit ratings increased borrowing costs and reduced financial flexibility. This made it more difficult for the company to raise funds and highlighted the long-term financial impact of the 737 MAX crisis on Boeing's stability and recovery.

4.2 Operational Impact

The Boeing 737 MAX crashes in 2018 and 2019 caused major operational disruptions for both Boeing and airlines worldwide. Following the global grounding of the 737 MAX fleet, airlines were forced to cancel thousands of flights, revise flight schedules, and lease replacement aircraft to maintain operations. Boeing suspended aircraft deliveries, reduced production, and later temporarily halted 737 MAX manufacturing while redesigning the MCAS flight control system and addressing regulatory requirements. Airlines also had to provide additional pilot training before the aircraft could safely return to service. These disruptions increased operating costs, reduced fleet availability, and delayed expansion plans for many airlines.

4.3 Brand and Reputation Impact

The Boeing 737 MAX crashes in 2018 and 2019 severely damaged Boeing's global brand reputation and eroded the trust that airlines, regulators, investors, and passengers had built over decades. The accidents raised concerns about Boeing's commitment to safety, engineering quality, and corporate transparency. The worldwide grounding of the 737 MAX and subsequent investigations intensified negative media coverage, causing the Boeing brand to become closely associated with safety failures rather than technological innovation.

The crisis also weakened customer confidence and affected Boeing's relationships with airline customers. Several airlines canceled or postponed aircraft orders, while passengers became reluctant to fly on Boeing 737 MAX aircraft. Boeing faced increased regulatory scrutiny and was required to implement extensive safety improvements before the aircraft could return to service. Rebuilding public confidence required significant investments in safety, transparency, pilot training, and corporate governance, demonstrating the long-term impact of the crashes on Boeing's brand image.

4.4 Stakeholder Impact

The Boeing 737 MAX crashes in 2018 and 2019 had significant consequences for multiple stakeholders. The families of the **346 victims** suffered irreparable losses and sought justice through legal action and compensation. Airlines operating the 737 MAX experienced flight disruptions, increased operational costs, and financial losses due to the worldwide grounding of the aircraft. Boeing's shareholders were affected by a decline in the company's profitability, while suppliers and manufacturers faced reduced production and revenue as Boeing slowed and temporarily halted 737 MAX production. In addition, aviation regulators such as the **Federal Aviation Administration (FAA)** and the **European Union Aviation Safety Agency (EASA)** faced increased scrutiny over aircraft certification processes and implemented stricter oversight to restore public confidence. Overall, the crisis damaged trust among customers, investors, employees, regulators, and the general public, highlighting the importance of safety, transparency, and accountability in the aviation industry.

5.Strategic Analysis

5.1 Swot Analysis

❖ Strengths

1. Diversified Business Portfolio

Boeing's diversified business portfolio is one of its major strengths. According to the 2018 and 2019 Annual Reports, the company operates through four business segments: Commercial Airplanes, Defense, Space & Security, Global Services, and Boeing Capital. This diversification enables Boeing to generate revenue from multiple markets, reducing its dependence on a single business segment while enhancing long-term business stability and resilience (Boeing Annual Report, 2018, pp. 1–2; Boeing Annual Report, 2019, pp. 1–2).

2. Strong Position in the Aerospace Industry

Boeing maintains a strong competitive position in the global aerospace industry. The 2018 and 2019 Annual Reports describe Boeing as one of the world's major aerospace firms and a leading producer of commercial aircraft, serving customers in the commercial aviation, defense, and space sectors worldwide. This strong market position enhances the company's competitive advantage and global reputation (Boeing Annual Report, 2018, p. 1; Boeing Annual Report, 2019, p. 1).

3. Strong Intellectual Property and Innovation

Another key strength of Boeing is its extensive intellectual property and innovation capability. The 2018 and 2019 Annual Reports state that the company owns numerous patents, trademarks, trade secrets, and engineering expertise that support continuous innovation and the development of advanced aerospace technologies. These valuable intellectual assets strengthen Boeing's competitive advantage and technological leadership (Boeing Annual Report, 2018, pp. 2–3; Boeing Annual Report, 2019, p. 2).

4. Strong Government and Defense Relationships

Boeing has established strong long-term relationships with major government organizations, particularly the U.S. Department of Defense (DoD) and NASA. The 2018 and 2019 Annual Reports indicate that the Defense, Space & Security segment generates the majority of its revenue from the U.S. DoD, reflecting Boeing's strong position in the defense sector and its ability to secure long-term government contracts (Boeing Annual Report, 2018, p. 1; Boeing Annual Report, 2019, p. 1).

❖ Weaknesses

1. Weak Safety Culture

One of Boeing's major weaknesses was its weak safety culture. Although the 2019 Annual Report emphasizes compliance with FAA regulations and continuing operational safety, investigations following the 737 MAX crashes revealed that Boeing prioritized production schedules and business objectives over passenger safety. The U.S. House Committee concluded that the company's safety culture was inadequate and that management failed to address critical safety concerns effectively (Boeing Annual Report, 2019, pp. 6–7; FAA JATR Report, 2019, pp. 21–28; U.S. House Committee Report, 2020, pp. 6–13).

2. Poor Design and Development of the MCAS System

Another major weakness was the flawed design and development of the Maneuvering Characteristics Augmentation System (MCAS). The House Committee Report found that Boeing designed MCAS to rely on a single angle-of-attack sensor without sufficient safeguards, while the FAA JATR Report identified shortcomings in the aircraft certification process that allowed these design flaws to remain undetected before certification (FAA JATR Report, 2019, pp. 53–69; U.S. House Committee Report, 2020, pp. 40–55).

3. Weak Regulatory Oversight

Boeing also experienced weaknesses in regulatory oversight. The 2019 Annual Report states that Boeing's commercial aircraft must comply with FAA regulations and continuing operational safety requirements. However, FAA investigations later found that excessive delegation of certification responsibilities to Boeing reduced the effectiveness of independent regulatory oversight, contributing to deficiencies in the certification of the 737 MAX (Boeing Annual Report, 2019, pp. 6–7; FAA JATR Report, 2019, pp. 9–20; U.S. House Committee Report, 2020, pp. 31–39).

4. Lack of Transparency and Communication

Boeing demonstrated weaknesses in transparency and communication during the development of the 737 MAX. The U.S. House Committee Report concluded that Boeing did not fully disclose the capabilities and risks of the MCAS system to airlines, pilots, and regulators, limiting pilot awareness and preparedness during emergency situations. The FAA Report also identified communication deficiencies between Boeing and regulators regarding the system's safety implications (FAA JATR Report, 2019, pp. 63–69; U.S. House Committee Report, 2020, pp. 47–55).

❖ Opportunities

1. Growth in Global Services

Boeing has an opportunity to expand its Global Services business by providing maintenance, engineering, logistics, spare parts, pilot training, and digital services to commercial and defense customers worldwide. As airlines seek cost-effective maintenance solutions, the Global Services segment can generate stable long-term revenue (Boeing Annual Report, 2018, pp. 1–2; 2019, pp. 1–2; 2020, pp. 2–3).

2. Expansion of Defense and Space Business

Boeing has significant opportunities to expand its Defense, Space & Security business through increasing government defense spending and space exploration programs. The annual reports identify the U.S. Department of Defense (DoD) and NASA as major customers, providing opportunities for long-term government contracts and business growth (Boeing Annual Report, 2018, p. 1; 2019, p. 1; 2020, pp. 1–2).

3. Technological Innovation and Digital Transformation

Boeing has an opportunity to strengthen its competitive advantage through continuous investment in advanced aerospace technologies, digital services, patents, engineering expertise, and data analytics. These capabilities support the development of innovative products and improve operational efficiency (Boeing Annual Report, 2018, pp. 2–3; 2019, p. 2; 2020, pp. 2–3).

4. Recovery and Future Growth in Commercial Aviation

Despite the challenges faced by the 737 MAX grounding and the COVID-19 pandemic, Boeing has opportunities to recover by resuming aircraft deliveries, strengthening customer relationships, and meeting future global demand for commercial aviation. The 2020 Annual Report highlights Boeing's efforts to safely return the 737 MAX to service and position the company for long-term recovery, while the 2018 and 2019 reports emphasize continued development of commercial aircraft programs (Boeing Annual Report, 2018, pp. 1–2; 2019, pp. 1–2; 2020, pp. 19–47).

❖ Threats

1. Product Safety and Quality Risks

Boeing faces a significant threat from product safety and quality failures, particularly following the two 737 MAX accidents and the subsequent global grounding of the aircraft. These events increased regulatory scrutiny, reduced customer confidence, and disrupted aircraft deliveries. The company acknowledges that restoring safety, quality, and public trust remains essential for its long-term success (Boeing Annual Report, 2019, pp. 2–5; 2020, pp. 19–47).

2. Legal and Regulatory Risks

Boeing is exposed to significant legal and regulatory risks due to ongoing investigations, litigation, compliance requirements, and increased oversight following the 737 MAX crisis.

Regulatory actions by aviation authorities may result in financial penalties, operational restrictions, and higher compliance costs. The annual reports discuss legal proceedings, government investigations, and regulatory matters as key business risks (Boeing Annual Report, 2019, pp. 84–90; 2020, pp. 116–123).

3. Intense Competition

Boeing faces intense competition from Airbus, its largest global competitor in the commercial aircraft industry. Despite the 737 MAX grounding, Airbus continued strengthening its market position by increasing aircraft deliveries, expanding its customer base, and introducing advanced aircraft models such as the A320neo family. This intensified competition placed additional pressure on Boeing to regain customer confidence, restore aircraft deliveries, maintain market share, and invest in innovation. The 2019 Annual Report identifies strong competition in the commercial aerospace market as a significant business challenge and notes that Boeing competes globally based on product performance, safety, reliability, technology, quality, and customer support. The report also explains that losing orders to competitors such as Airbus could adversely affect Boeing's financial performance and long-term growth (Boeing Annual Report, 2019, pp. 4–6). During the 737 MAX crisis, Airbus gained a competitive advantage by attracting airlines seeking alternative aircraft, further increasing competitive pressure on Boeing.

4. Financial Risks

The 737 MAX grounding, reduced aircraft deliveries, legal settlements, and the COVID-19 pandemic significantly affected Boeing's financial performance. The company faces continuing threats from declining revenues, increased operating costs, liquidity pressures, and future financial obligations. Boeing's annual reports describe the significant financial impact of these events on the company's overall performance (Boeing Annual Report, 2019, pp. 30–42; 2020, pp. 53–67).

5. Supply Chain Disruptions

Boeing relies on a complex global supply chain for aircraft manufacturing. Disruptions caused by supplier delays, production interruptions, shortages of critical components, or global crises can negatively affect production schedules, aircraft deliveries, and customer satisfaction. The annual reports highlight the importance of supply chain stability in maintaining operational performance (Boeing Annual Report, 2019, pp. 4–6; 2020, pp. 42–47).

6. Cybersecurity Risks

As Boeing increasingly depends on digital technologies and connected systems, cybersecurity threats have become an important business risk. Cyberattacks, data breaches, and disruptions to critical information systems could affect business operations, intellectual property, and customer confidence. Boeing identifies cybersecurity as an important enterprise risk requiring continuous monitoring and investment (Boeing Annual Report, 2019, pp. 14–16; 2020, pp. 16–18).

7. Global Economic and Pandemic Risks

Global economic uncertainty, international trade tensions, and the COVID-19 pandemic significantly reduced demand for commercial aircraft and disrupted airline operations

worldwide. These external factors continue to threaten Boeing's commercial aviation business and long-term financial recovery (Boeing Annual Report, 2020, pp. 2–5; 53–67).

8. Reputational Damage

The 737 MAX accidents caused substantial reputational damage to Boeing, reducing public confidence, customer trust, and stakeholder support. Restoring the company's reputation through improvements in safety, transparency, governance, and quality management remains a major challenge and an ongoing external threat (Boeing Annual Report, 2019, pp. 2–5; 2020, pp. 19–47).

6.Recovery and Crisis Management

6.1 Immediate Crisis Response

The two fatal 737 MAX accidents marked one of the most significant crises in Boeing's history, resulting in the loss of 346 lives. In response, Boeing acknowledged the impact of the tragedies on the victims' families, airline customers, and the aviation industry. The company expressed its commitment to learning from the accidents and emphasized that safety, quality, and integrity would become its highest priorities moving forward. Boeing also identified the safe return of the 737 MAX as a key objective while focusing on strengthening its organizational culture and rebuilding stakeholder trust. Furthermore, the company stated that restoring public confidence would require consistent efforts through safer aircraft operations, improved customer relationships, and a stronger commitment to safety.

Boeing's immediate response demonstrated an important shift from crisis acknowledgment to organizational recovery. By recognizing the consequences of the accidents and publicly committing to improved safety standards, the company sought to reassure regulators, airline customers, and passengers. Although these statements alone could not restore trust, they established the foundation for the technical, operational, and governance reforms that followed.

6.2 Safety and Operational Recovery

Following the 737 MAX accidents, Boeing redesigned the MCAS software and updated pilot training and maintenance procedures. The FAA conducted a comprehensive 22-month review involving more than 40 technical experts and over 60,000 hours of testing before approving the aircraft's return to service (FAA, 2020, p. 5).

Boeing also strengthened pilot training and established a dedicated Product & Services Safety organization while implementing an enterprise Safety Management System (SMS) to improve safety culture and rebuild stakeholder trust (Committee on Transportation and Infrastructure, 2020, p. 159; Boeing Annual Report, 2020, p. 2).

These initiatives addressed the technical and operational weaknesses that contributed to the accidents. The software updates, enhanced pilot training, and improved safety processes strengthened aircraft safety and supported Boeing's efforts to restore stakeholder confidence.

6.3 Leadership and Governance Recovery

To strengthen corporate governance after the 737 MAX crisis, Boeing implemented significant leadership and governance reforms. Dennis A. Muilenburg, who served as President and CEO in 2018 and 2019, stepped down following the 737 MAX grounding and was succeeded by David L. Calhoun in January 2020 to lead the company's recovery (Boeing Annual Report, 2018; Boeing Annual Report, 2019).

Boeing also strengthened its governance by establishing a dedicated Product & Services Safety organization, implementing an enterprise Safety Management System (SMS), and providing safety training to all employees to improve safety culture and accountability (Boeing Annual Report, 2020, p. 2).

These leadership and governance reforms strengthened Boeing's corporate oversight and reinforced its commitment to safety, accountability, and transparency. The changes also supported the company's efforts to rebuild stakeholder confidence and improve long-term organizational performance.

6.4 Trust and Business Recovery

Following the return of the 737 MAX to service, Boeing made significant progress in rebuilding customer confidence and restoring business operations. During 2021, global regulators and aviation authorities, including the European Union Aviation Safety Agency (EASA), U.K. Civil Aviation Authority, Air Canada, UAE General Civil Aviation Authority, Australia Civil Aviation Safety Authority, and the U.S. Federal Aviation Administration (FAA), approved or supported the aircraft's return to service. Several airlines, including United Airlines, Southwest Airlines, Alaska Airlines, flydubai, and Turkish Airlines, resumed 737 MAX operations, demonstrating growing confidence in the aircraft's safety (Boeing Annual Report, 2021, p. 3).

The approvals from global regulators and the return of major airlines to 737 MAX operations reflected increasing stakeholder confidence in Boeing's safety improvements. These milestones supported the company's efforts to rebuild trust, restore business operations, and strengthen its long-term market position.

7. Investigation Findings

7.1 Delayed Occurrence of the First Boeing 737 MAX Accident

The Boeing 737 MAX entered commercial service in May 2017, yet the first fatal accident occurred only in October 2018. The investigation revealed that the aircraft's design flaw remained dormant because MCAS was activated only under very specific conditions involving erroneous Angle of Attack (AoA) sensor data. Since these conditions did not occur during the aircraft's initial months of operation, thousands of flights were completed safely before the first accident. Therefore, the aircraft was not unsafe on every flight; rather, a latent design weakness became catastrophic only when triggered by faulty sensor inputs.

7.2 Operational Performance of MCAS Prior to the Accidents

The investigation found that MCAS did not malfunction during every flight because it depended on incorrect AoA sensor data to activate. The original MCAS relied on a single AoA sensor without validating its readings against a second sensor. During normal operations, accurate sensor data prevented unintended MCAS activation. The accidents occurred only after faulty AoA sensors transmitted erroneous information, demonstrating that the design weakness remained hidden until a specific combination of technical failures occurred.

7.3 Circumstances Surrounding the Lion Air and Ethiopian Airlines Accidents

The investigation determined that the accidents resulted from a combination of technical, operational, and organizational failures rather than from the airlines themselves. Both aircraft experienced faulty AoA sensor readings that repeatedly activated MCAS. In addition, pilots were unaware of the existence and operation of MCAS because it was not included in the original pilot training or flight manuals. The Lion Air investigation further identified maintenance deficiencies and inadequate fault documentation, while both investigations highlighted shortcomings in regulatory oversight and aircraft certification. These combined failures allowed the latent design flaw to develop into catastrophic accidents.

7.4 Contributing Factors to the Boeing 737 MAX Accidents

The investigation concludes that no single factor caused the accidents. Official investigation reports consistently identify the MCAS design and Boeing's certification approach as the primary causes. Maintenance deficiencies at Lion Air, disputed aspects of the Ethiopian crew's response, and organizational shortcomings acted as contributing factors rather than root causes. The evidence supports a chain-of-failure model in which aircraft design, maintenance, pilot response, airline operations, and regulatory oversight collectively contributed to the accidents.

7.5 Adoption of the Boeing 737 MAX by Leading Global Airlines

The investigation indicates that many of the world's leading airlines continue to operate the Boeing 737 MAX, while others have chosen different aircraft based on business strategy rather than unresolved safety concerns. Airlines that already operated the Boeing 737 family generally retained the MAX because of fleet commonality, fuel efficiency, and lower operating costs. Airlines committed to Airbus fleets or operating primarily wide-body aircraft generally chose not to introduce the Boeing 737 MAX into their fleets. Therefore, fleet strategy and operational requirements are the primary factors influencing airline decisions.

7.6 Continued Operation of the Boeing 737 MAX

The investigation shows that airlines continue operating the Boeing 737 MAX because the aircraft underwent extensive software redesign, mandatory pilot training, and independent recertification by international aviation authorities. In addition to the improved safety standards, airlines continue using the aircraft because of its fuel efficiency, lower operating costs, fleet commonality, and suitability for regional and medium-haul operations. Current operators therefore base their decisions on both safety improvements and long-term operational benefits.

7.7 Fleet Strategy and Non-Adoption of the Boeing 737 MAX

The investigation found that airlines choosing not to operate the Boeing 737 MAX generally do so because of fleet strategy rather than safety concerns. Airlines such as Emirates, Cathay Pacific, and Air France have developed long-term fleet strategies centred on wide-body aircraft or Airbus narrow-body fleets. Consequently, introducing the Boeing 737 MAX would increase operational complexity without providing significant strategic benefits.

7.8 Fleet Strategies of the World's Leading Airlines

The investigation demonstrates that airline fleet decisions are influenced primarily by business strategy, route network, fleet commonality, operational economics, and existing aircraft commitments. While airlines such as Qatar Airways, Singapore Airlines, ANA, Turkish Airlines, Korean Air, Japan Airlines, and Hainan Airlines operate the Boeing 737 MAX, others such as Emirates, Cathay Pacific, and Air France continue with alternative fleet strategies. These decisions reflect long-term operational planning rather than judgments about the aircraft's safety following recertification.

7.9 Boeing 737 MAX Adoption Among Indian Airlines

The investigation shows that Indian airlines have adopted different fleet strategies. Akasa Air operates an all-Boeing 737 MAX fleet because of its low operating costs and simplified maintenance strategy. Air India Express operates the aircraft as part of its fleet renewal and corporate restructuring. SpiceJet continues operating the Boeing 737 MAX despite financial constraints, while IndiGo remains committed to the Airbus A320 family, using Boeing 737 MAX aircraft only through temporary wet-lease arrangements. These differences reflect airline strategy and business requirements rather than concerns about aircraft safety.

7.10 Emirates' Fleet Strategy and the Boeing 737 MAX

The investigation confirms that Emirates does not operate the Boeing 737 MAX primarily because of its all-wide-body fleet strategy and hub-and-spoke business model. Short-haul operations are already handled by its sister airline, flydubai, eliminating the need for narrow-body aircraft within the Emirates fleet. Although Emirates has expressed concerns regarding Boeing's manufacturing quality, its decision is fundamentally based on long-term operational strategy rather than unresolved concerns about the aircraft's safety.

7.11 Continued Market Demand for the Boeing 737 MAX

The investigation concludes that airlines continue purchasing the Boeing 737 MAX because the aircraft underwent significant design improvements, independent regulatory recertification, and mandatory pilot training. The redesigned MCAS, enhanced safety procedures, fuel efficiency, fleet commonality, and lower operating costs make the aircraft an attractive option for many airlines. The aircraft's strong operational performance following its return to service has further contributed to renewed industry confidence.

7.12 Post-Accident Design Improvements and Recertification of the Boeing 737 MAX

The investigation confirms that the Boeing 737 MAX currently in service differs significantly from the aircraft involved in the 2018 and 2019 accidents. Boeing redesigned the MCAS

software to compare data from both AoA sensors, limited MCAS activation, enhanced pilot override capability, introduced mandatory pilot training, updated flight manuals, and implemented additional regulatory oversight before the aircraft returned to commercial service.

7.13 Allocation of Responsibility for the Boeing 737 MAX Crisis

The investigation concludes that responsibility cannot be assigned solely to Boeing. Although Boeing's MCAS design decisions and limited disclosure represented the primary causes, the FAA's certification process, maintenance deficiencies, airline operational practices, and pilot response also contributed to the accidents. The Boeing 737 MAX crisis therefore represents a systemic failure involving technology, governance, organizational decision-making, regulatory oversight, and operational management rather than a single technical defect or individual error.

7. Lessons learned

1. Safety should come before commercial objectives

The Boeing 737 MAX crisis showed that commercial objectives such as cost reduction, competition with Airbus, and faster market entry should never compromise passenger safety. Safety must remain the highest priority when making aircraft design, development, and business decisions.

2. Strong corporate governance is essential

The crisis demonstrated the importance of effective Board and senior management oversight of safety and risk. Strong governance is necessary to ensure that critical engineering and safety concerns are properly reviewed and resolved before they become major problems.

3. Effective risk management is necessary

Boeing did not adequately identify and address the risks associated with MCAS before the aircraft entered service. Organizations therefore need to identify, assess, and continuously monitor major risks, particularly when dealing with safety-critical technologies and systems.

4. Transparency and communication build trust

Important information about MCAS was not fully communicated to pilots, airlines, and regulators. The crisis showed that clear and transparent communication is essential, especially when dealing with safety-critical systems, because stakeholders need accurate information to understand and respond to risks effectively.

5. Independent oversight is important

The crisis highlighted the importance of strong independent regulatory oversight. Excessive delegation of certification responsibilities reduced independent review, showing that critical safety decisions should receive appropriate external and independent scrutiny.

6. Organizations must learn continuously from failures

The Boeing case demonstrates that organizations should learn from accidents and failures rather than treating them as isolated events. Continuous learning, stronger safety culture, and ongoing improvement of organizational processes are essential for preventing similar failures in the future.

8. Our Consulting Recommendations

1. Strengthen the Safety Management System (SMS)

Boeing should continuously improve its Safety Management System and use it throughout the aircraft development lifecycle. This will help the organization identify and control safety risks from the early stages of development through certification and delivery.

2. Improve independent safety and governance reviews

Boeing should establish stronger independent safety reviews at both Board and management levels. This can help ensure that important engineering and safety concerns are properly considered and cannot simply be overridden by production or financial objectives.

3. Strengthen risk identification and monitoring

Boeing should conduct regular risk assessments, scenario testing, and independent technical reviews for safety-critical technologies before aircraft are certified and delivered. This would help identify important risks earlier and provide opportunities to address them before they become serious safety problems.

4. Improve transparency and stakeholder communication

Boeing should provide clear and timely information about important safety risks and system changes to regulators, airlines, pilots, employees, investors, and passengers. Better communication can help rebuild and maintain stakeholder trust while ensuring that those involved have the information needed to understand safety issues.

5. Promote a safety-first organizational culture

Boeing should continue safety training and create an environment where engineers and employees can report concerns without pressure. Safety should be treated as an organizational priority rather than simply as a compliance requirement.

6. Continue investing in safety technology and training

Boeing should continue investing in advanced safety technologies, pilot training, system redundancy, and continuous testing. These investments can help strengthen aircraft safety and reduce the possibility of similar failures occurring in the future.

9. Conclusion

The Boeing 737 MAX crisis demonstrated how a combination of engineering weaknesses, competitive pressure, governance failures, inadequate risk management, and insufficient transparency can create a major corporate crisis. The decision to upgrade the existing 737 to compete with Airbus, together with the introduction of MCAS, created risks that were not adequately identified and controlled. The two fatal accidents exposed weaknesses not only in the aircraft's design, but also in pilot communication, certification, regulatory oversight, leadership, and organizational decision-making. The resulting global grounding caused severe financial, operational, reputational, and stakeholder impacts, including major revenue losses, reduced aircraft deliveries, and loss of public trust. Boeing responded through MCAS redesign, enhanced pilot training, stronger safety management, leadership changes, increased regulatory oversight, and efforts to rebuild stakeholder confidence. However, the case shows that technical improvements alone are not enough. Long-term recovery requires a safety-first culture, independent governance, strong risk management, transparent communication, and continuous investment in safety and training. Ultimately, the Boeing 737 MAX crisis demonstrates that commercial success and technological innovation can only be sustainable when safety, ethics, accountability, and stakeholder trust remain at the centre of business strategy.

References

<https://www.faa.gov/newsroom/preliminary-summary-faas-review-boeing-737-max>

Preliminary Summary of the FAA's Review of the Boeing 737 MAX (Federal Aviation Administration) United States Government

<https://www.oig.dot.gov/library-item/37940> U.S. Department of Transportation, Office of Inspector General (DOT OIG)

<https://democrats-transportation.house.gov/committee-activity/boeing-737-max-investigation>
The House Committee on Transportation & Infrastructure

<https://www.boeing.com/company> Boeing Website

<https://www.airbus.com/en/newsroom/stories/2018-06-airbus-jetliners-a-standard-setting-history?utm> Airbus Website

STATEMENT OF ROBERT H. BINDER, ASSISTANT SECRETARY OF TRANSPORTATION FOR POLICY, PLANS AND INTERNATIONAL AFFAIRS, BEFORE THE SUBCOMMITTEE ON AVIATION OF THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, ON THE EFFECTS OF THE ENERGY CRISIS ON AVIATION, JUNE 25, 1975.

[Jong, W., & Broekman, P. \(2021\). Crisis history and hindsight: a stakeholder perspective on the case of Boeing 737-Max. Public Relations Inquiry, 10\(2\), 185-196.](#)

[Jong, W., & Broekman, P. \(2021\). Crisis history and hindsight: a stakeholder perspective on the case of Boeing 737-Max. Public Relations Inquiry, 10\(2\), 185-196.](#)

<https://www.scribd.com/document/516706015/Ethiopian-Airlines>

Herkert, J., Borenstein, J., & Miller, K. (2020). The Boeing 737 MAX: Lessons for engineering ethics. *Science and engineering ethics*, 26(6), 2957-2974. Springer

Abdeldayem, M. M., Aldulaimi, S. H., Abu-AlSondos, I. A., & Baqi, A. (2023, May). Corporate governance and sustainability development goals: Boeing case study. In Conference on Sustainability and Cutting-Edge Business Technologies (pp. 354-366). Cham: Springer Nature Switzerland.

Herkert, J., Borenstein, J., & Miller, K. (2020). The Boeing 737 MAX: Lessons for engineering ethics. *Science and engineering ethics*, 26(6), 2957-2974. Springer 3.5

<https://digitalcollections.lib.washington.edu/digital/collection/reports/id/44105/Boeing>
Annual Report 1997

https://s2.q4cdn.com/661678649/files/doc_financials/2019/ar/2019_Boeing_Annual_Report.pdf Boeing Annual Report 2019

https://s2.q4cdn.com/661678649/files/doc_financials/2020/ar/2020_The_Boeing_Company_Annual_Report.pdf Boeing Annual Report 2020

https://s2.q4cdn.com/661678649/files/doc_financials/annual/2019/Boeing-2018AR-Final.pdf
Boeing Annual Report 2018

<https://www.bbc.com/news/world-africa-47553174> BBC News

<https://www.bbc.com/news/business-50177788> BBC News

Appendix A

FINANCIAL HIGHLIGHTS					
<i>The merger of The Boeing Company and McDonnell Douglas Corporation was effective August 1, 1997. All current and historical information reflects the combined company.</i>					
<i>(Dollars in millions except per share data)</i>	1997	1996	1995	1994	1993
Sales and Other Operating Revenues	\$ 45,800	\$ 35,453	\$32,960	\$34,969	\$39,711
Comparative Net Earnings	632 ^(a)	1,905 ^(b)	1,479 ^(c)	1,483	1,640
Comparative Earnings per Share	0.63 ^(a)	1.92 ^(b)	1.49 ^(c)	1.48	1.64
Contractual Backlog	121,640	114,173	95,488	86,956	96,657
Research and Development	1,924	1,633	1,674	2,076	2,077
Capital Expenditures, net	1,391	971	747	883	1,349
Cash and Short-term Investments	5,149	6,352	4,527	3,064	3,194
Customer and Commercial Financing Assets	4,600	3,888	4,212	5,408	5,534
Total Debt	6,854	7,489	5,401	5,247	5,840
Cash Dividends	557	480	434	395	395

Source: Boeing Annual Report 1997 (Shows Boeing & McDonnell Douglas Corporation Merger)

Boeing Completes McDonnell Douglas Merger

[f](#) [in](#) [X](#) [e](#) [r](#)

The Boeing Company today announced that appropriate merger filings have been submitted to the State of Maryland and that the merger of Boeing and McDonnell Douglas will become effective at 12:01 a.m. (Eastern Daylight Time) on Aug. 1, 1997. Value of the transaction is \$16.3 billion.

McDonnell Douglas stock ceased to be traded on the New York Stock Exchange at the close of business today.

Each shareholder of McDonnell Douglas will receive 1.3 shares of Boeing common stock for each share of McDonnell Douglas common stock, except that cash will be paid in lieu of fractional shares of Boeing stock.

McDonnell Douglas shareholders who hold their own stock certificates will receive notice in the mail regarding the process to exchange their shares for Boeing shares.

McDonnell Douglas shareholders whose certificates are held by brokers will receive the exchange of shares through their broker.

Source: Boeing Press Release

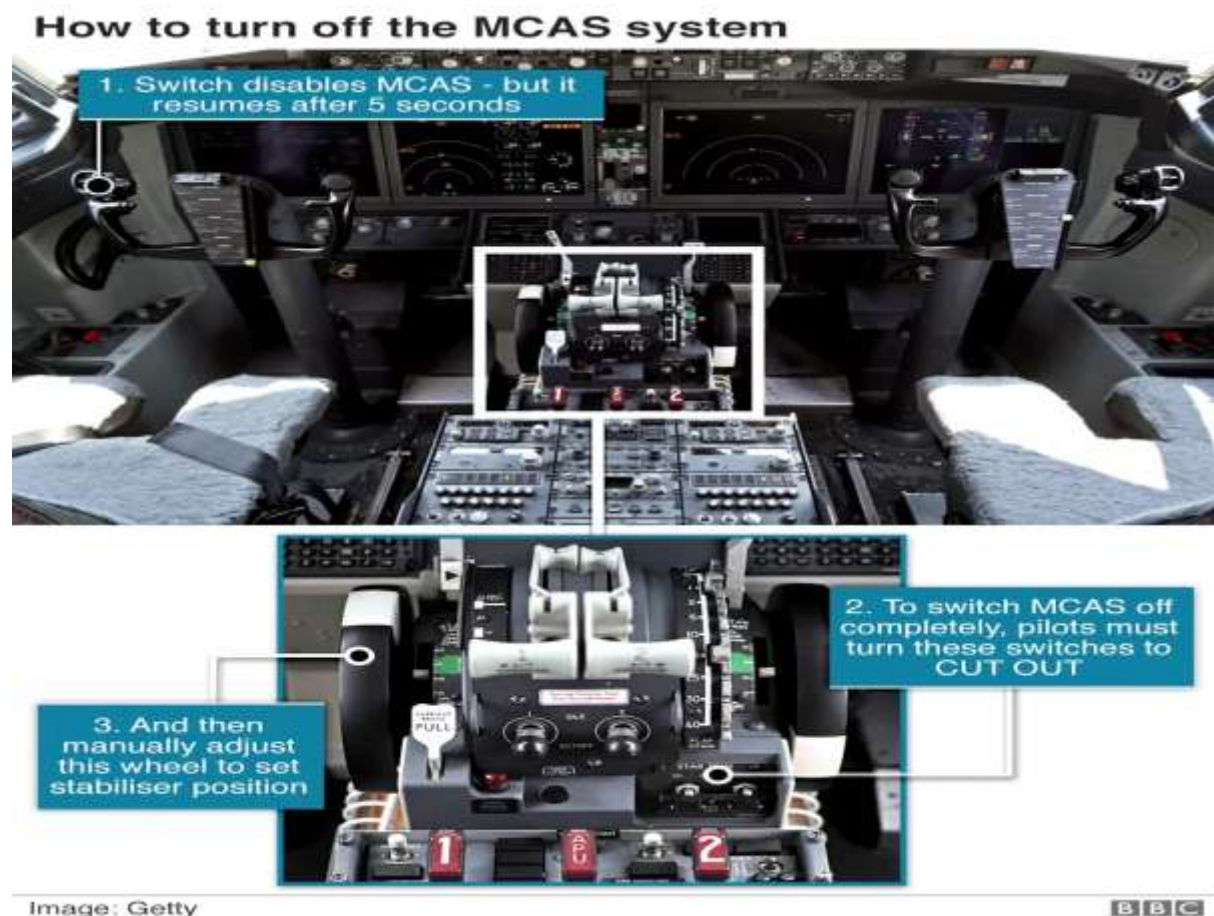
Appendix B

Figure 3 - 737 NG (left) vs 737 MAX (right)



Source: Leeham News 2020

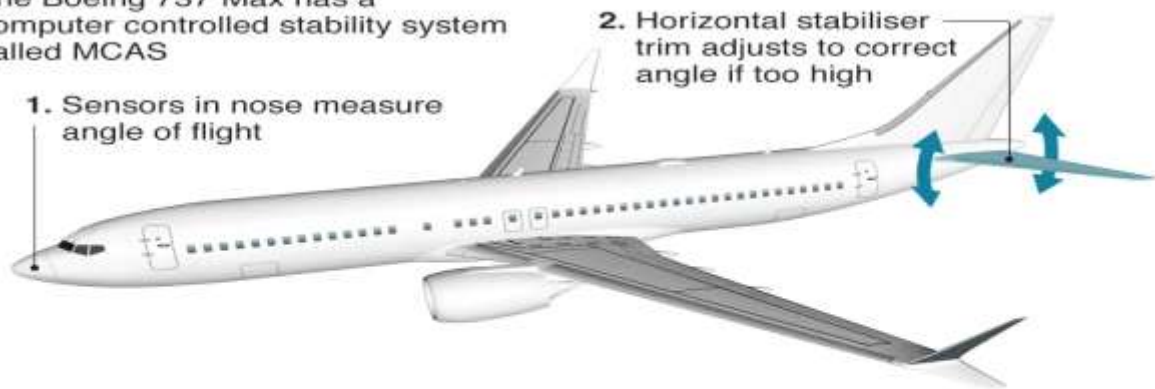
737 NG vs 737 MAX engine comparison — larger engine / higher & forward position



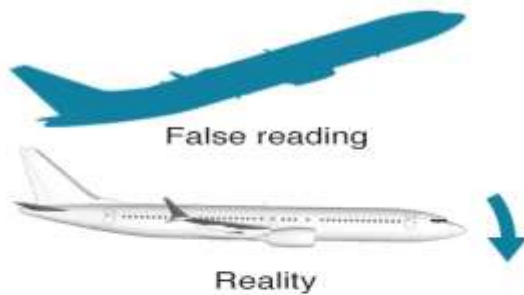
Source: BBC News (MCAS System)

How the MCAS system works

The Boeing 737 Max has a computer controlled stability system called MCAS



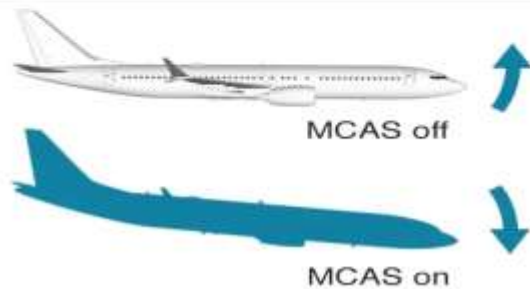
3. Nose pushed down to reduce risk of a stall



4. But if the sensor reading is wrong, MCAS may activate and push the nose down anyway

5. Pilots can temporarily switch off MCAS and pull up.

But system restarts if false readings continue, creating a tug of war between the aircraft and its crew



Source: Boeing, The Air Current

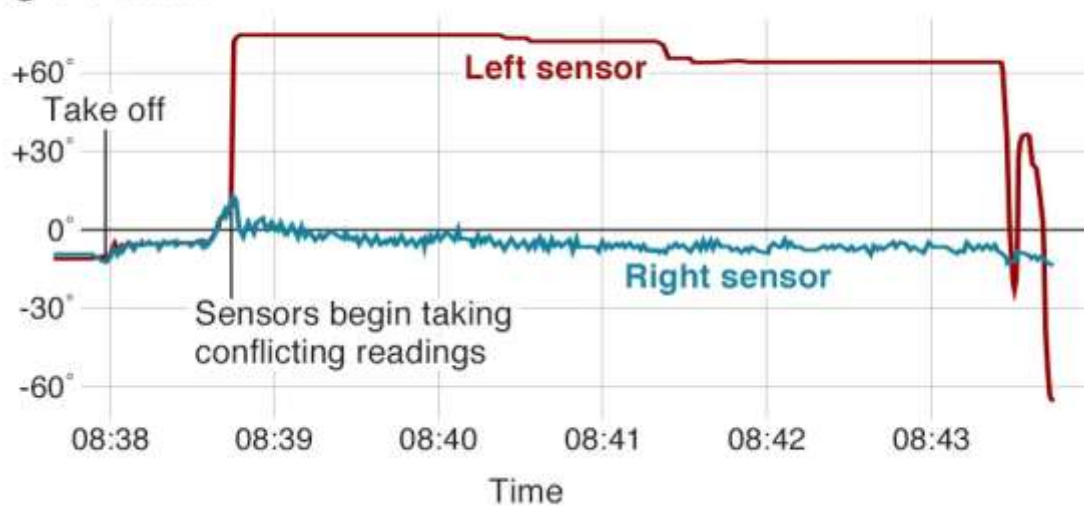
BBC



AOA Sensor Photo Source : BBC News

The plane's sensors took different readings

Angle of attack



Source: Ethiopian Aircraft Accident Investigation Bureau

BBC

Source: BBC News

Appendix C

A series of failures led to the crash of a Lion Air flight, which killed 189 people and led to the grounding of the Boeing 737 Max, a report has found.

Investigators said faults by Boeing, Lion Air and pilots caused the crash.

Five months after the disaster in October last year, an Ethiopian Airlines plane crashed, killing all 157 people on board, which led to the grounding of the entire 737 Max fleet.

Faults with the plane's design have been linked to both crashes.

On Friday, air crash investigators in Indonesia released their final report, detailing the list of events that caused the Lion Air jet to plunge into the Java Sea.

"From what we know, there are nine things that contributed to this accident," Indonesian air accident investigator Nurcahyo Utomo told reporters at a news conference.

"If one of the nine hadn't occurred, maybe the accident wouldn't have occurred."

Source: BBC News

Everyone affected by the Lion Air Flight 610 and Ethiopian Airlines Flight 302 accidents — including the loved ones of those on board and our airline customers and their people — has experienced unimaginable loss and sorrow. All of us at Boeing mourn with them and share their heartbreak.

We will never forget the 346 lives lost in the 737 MAX tragedies. They have changed us and our industry forever. We're humbly learning from the accidents and are committed to using what we learn to improve safety and quality, because all who rely on our products and services deserve our best.

That includes our ongoing commitment to our values, with an emphasis on the highest standards of safety, quality and integrity. You can see this dedication throughout the company as our people work to strengthen our culture for the better and focus on our priorities. Foremost among these priorities is the safe return to service of the 737 MAX.

Source: Boeing Annual Report 2019

Appendix D

Executive Summary

Introduction

This report provides a detailed technical account of the lessons learned since the two fatal accidents involving the Boeing 737 MAX aircraft, as well as actions the U.S. Federal Aviation Administration (FAA) took to ensure the airplane's safe return to service. As the State of Design agent, the FAA is providing this report to all States of Registry and to the general public to explain how the agency identified and addressed the safety issues affecting the 737 MAX.

The FAA's intent is to assure the global community that the 737 MAX is safe to operate and meets FAA certification standards. This report contains details of the FAA's comprehensive review of the manufacturer's proposed changes to the airplane's Maneuvering Characteristics Augmentation System (MCAS). This includes associated system parts, software and mechanical characteristics, safety assumptions, and systems assessments. Additionally, this report discusses the design, operation, revised pilot training, and maintenance changes that effectively address the causes of the Lion Air Flight 610 (JT610) and Ethiopian Airlines Flight 302 (ET302) accidents.

During its evaluation of Boeing's proposed modifications, the FAA retained all compliance findings and approvals associated with the design changes related to MCAS. This thorough review has taken more than 22 months and included the full-time work of more than 40 engineers, inspectors, pilots, and technical support staff. The effort represents more than 60,000 FAA hours of review, certification testing, and evaluation of pertinent documents. This includes approximately 50 hours of FAA flight or simulator tests and FAA analysis of more than 4,000 hours of company flight and simulator testing.

Source: Federal Aviation Administration U.S Government

Introduction

In October 2018 and March 2019, Boeing 737 MAX passenger jets crashed minutes after takeoff; these two accidents claimed nearly 350 lives. After the second incident, all 737 MAX planes were grounded worldwide. The 737 MAX was an updated version of the 737 workhorse that first began flying in the 1960s. The crashes were

✉ Joseph Herkert
jherkert@ncsu.edu

¹ North Carolina State University, Raleigh, NC, USA

² Georgia Institute of Technology, Atlanta, GA, USA

³ University of Missouri – St. Louis, St. Louis, MO, USA

 Springer

2958

J. Herkert et al.

precipitated by a failure of an Angle of Attack (AOA) sensor and the subsequent activation of new flight control software, the Maneuvering Characteristics Augmentation System (MCAS). The MCAS software was intended to compensate for changes in the size and placement of the engines on the MAX as compared to prior versions of the 737. The existence of the software, designed to prevent a stall due to the reconfiguration of the engines, was not disclosed to pilots until after the first crash. Even after that tragic incident, pilots were not required to undergo simulation training on the 737 MAX.

Overview of 737 MAX History and Crashes

In December 2010, Boeing's primary competitor Airbus announced the A320neo family of jetliners, an update of their successful A320 narrow-body aircraft. The A320neo featured larger, more fuel-efficient engines. Boeing had been planning to introduce a totally new aircraft to replace its successful, but dated, 737 line of jets; yet to remain competitive with Airbus, Boeing instead announced in August 2011 the 737 MAX family, an update of the 737NG with similar engine upgrades to the A320neo and other improvements (Gelles et al. 2019). The 737 MAX, which entered service in May 2017, became Boeing's fastest-selling airliner of all time with 5000 orders from over 100 airlines worldwide (Boeing n.d. a) (See Fig. 1 for timeline of 737 MAX key events).

The 737 MAX had been in operation for over a year when on October 29, 2018, Lion Air flight JT610 crashed into the Java Sea 13 minutes after takeoff from Jakarta, Indonesia; all 189 passengers and crew on board died. Monitoring from the flight data recorder recovered from the wreckage indicated that MCAS, the software specifically designed for the MAX, forced the nose of the aircraft down 26 times in 10 minutes (Gates 2018). In October 2019, the Final Report of Indonesia's Lion Air Accident Investigation was issued. The Report placed some of the blame on the pilots and maintenance crews but concluded that Boeing and the FAA were primarily responsible for the crash (Republic of Indonesia 2019).

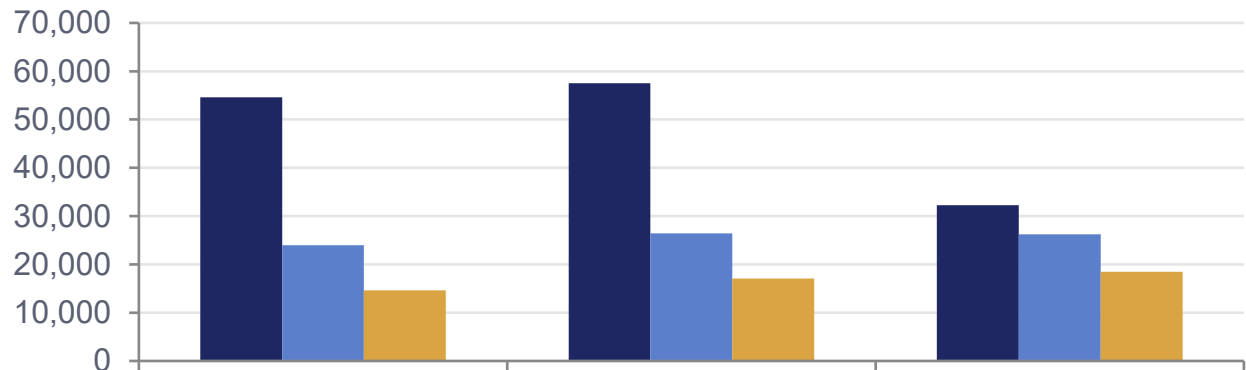
MCAS was not identified in the original documentation/training for 737 MAX pilots (Glanz et al. 2019). But after the Lion Air crash, Boeing (2018) issued a Flight Crew Operations Manual Bulletin on November 6, 2018 containing procedures for responding to flight control problems due to possible erroneous AOA inputs. The next day the FAA (2018a) issued an Emergency Airworthiness Directive on the same subject; however, the FAA did not ground the 737 MAX at that time.

Springer

Source: - Herkert, J., Borenstein, J., & Miller, K. (2020). The Boeing 737 MAX: Lessons for Engineering Ethics: J. Herkert et al. Science and engineering ethics, 26(6), 2957-2974.

Appendix E

Revenue by Business Segment (US\$ billion)



Source:

■ Commercial Airplanes ■ Defense, Space & Security ■ Global Services

Boeing Annual report 2019 (Developed by Group Members)

Our 2019 financial results were adversely affected by the 737 MAX grounding, with material reductions in revenue, earnings per share and operating cash flow. We have taken action to prudently manage our liquidity, increase our balance sheet flexibility and appropriately prioritize our spending while still making necessary investments in our people, products and processes.

Financial Overview

U.S. dollars in millions except per share data	2019	2018	2017	2016	2015
Revenues	76,559	101,127	94,005	93,496	96,114
(Loss)/earnings from operations	(1,975)	11,987	10,344	6,527	7,443
Diluted (loss)/earnings per share	(1.12)	17.85	13.85	7.83	7.44
Operating margins	(2.6%)	11.9%	11.0%	7.0%	7.7%
Core operating (loss)/earnings*	(3,390)	10,660	8,906	5,170	7,741
Core operating margins*	(4.4%)	10.5%	9.5%	5.5%	8.1%
Core (loss)/earnings per share*	(3.47)	16.01	12.33	6.94	7.72
Operating cash flow	(2,446)	15,322	13,346	10,496	9,363
Contractual backlog	436,473	462,070	456,984	458,277	476,595
Total backlog†	463,403	490,481	474,640	473,492	489,299

*Non-GAAP measures. See page 135.

† Total backlog includes contractual and unobligated backlog. See page 24 of the Form 10-K.

Amounts prior to 2016, along with 2016 Backlog, do not reflect impact of the adoption of ASU No. 2014-09, Revenue from Contracts with Customers (Topic 606); ASU No. 2017-07, Compensation – Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost; ASU 2016-18 Statement of Cash Flows (Topic 230) Restricted Cash; in the first quarter of 2018.

The following table summarizes cost of sales:

(Dollars in millions)

Years ended December 31	2019	2018	Change	2018	2017	Change
Cost of sales	\$72,093	\$81,490	(\$9,397)	\$81,490	\$76,612	\$4,878
Cost of sales as a % of revenues	94.2%	80.6%	13.6%	80.6%	81.5%	(0.9)%

Cost of sales decreased by \$9,397 million in 2019 compared with 2018, primarily due to lower revenue and lower reach-forward losses. Cost of sales as a percentage of Revenues increased in 2019 primarily due to the 737 MAX grounding.

	737 *
2020	
Cumulative deliveries	7,482
Deliveries	43 (14)
2019	
Cumulative deliveries	7,439
Deliveries	127 (19)
2018	
Cumulative deliveries	7,312
Deliveries	580 (15)

	737 *	747	767 *	777	787	Total
2022						
Cumulative deliveries	8,132	1,572	1,271	1,701	1,037	
Deliveries	387 ⁽¹³⁾	5	33 ⁽¹⁵⁾	24	31	480
2021						
Cumulative deliveries	7,745	1,567	1,238	1,677	1,006	
Deliveries	263 ⁽¹⁶⁾	7	32 ⁽¹³⁾	24	14	340
2020						
Cumulative deliveries	7,482	1,560	1,206	1,653	992	
Deliveries	43 ⁽¹⁴⁾	5	30 ⁽¹¹⁾	26	53	157

* Intercompany deliveries identified by parentheses

BCA deliveries, including intercompany deliveries, as of December 31 were as follows:

	737 *	747	767 *	777	787	Total
2025						
Cumulative deliveries	9,240	1,573	1,351	1,776	1,249	
Deliveries	447 ⁽⁷⁾		30 ⁽¹⁵⁾	35	88	600
2024						
Cumulative deliveries	8,793	1,573	1,321	1,741	1,161	
Deliveries	265 ⁽⁵⁾		18 ⁽⁸⁾	14	51	348
2023						
Cumulative deliveries	8,528	1,573	1,303	1,727	1,110	
Deliveries	396 ⁽⁹⁾	1	32 ⁽¹⁴⁾	26	73	528

* Intercompany deliveries identified by parentheses

Source: Boeing Annual Report 2020 - 2025

Item 2. Properties

We occupied approximately 86 million square feet of floor space on December 31, 2019 for manufacturing, warehousing, engineering, administration and other productive uses, of which approximately 93% was located in the United States. The following table provides a summary of the floor space by business as of December 31, 2019:

(Square feet in thousands)	Owned	Leased	Government Owned ⁽¹⁾	Total
Commercial Airplanes	41,098	2,471		43,569
Defense, Space & Security	23,401	5,651		29,052
Global Services	886	7,596		8,482
Other ⁽²⁾	2,504	2,214	318	5,036
Total	67,889	17,932	318	86,139

⁽¹⁾ Excludes rent-free space furnished by U.S. government landlord of 49 square feet.

⁽²⁾ Other includes BCC, sites used for common internal services, and our Corporate Headquarters.

Source: Boeing Annual Report 2018,2019 & 2020

(In millions - except per share amounts)

Years ended December 31,	2020	2019	2018
Net (loss)/earnings attributable to Boeing Shareholders	(\$11,873)	(\$636)	\$10,460
Less: earnings available to participating securities			7
Net (loss)/earnings available to common shareholders	(\$11,873)	(\$636)	\$10,453
Basic			
Basic weighted average shares outstanding	569.0	566.0	579.9
Less: participating securities	0.4	0.6	0.7
Basic weighted average common shares outstanding	568.6	565.4	579.2
Diluted			
Basic weighted average shares outstanding	569.0	566.0	579.9
Dilutive potential common shares ⁽¹⁾			6.3
Diluted weighted average shares outstanding	569.0	566.0	586.2
Less: participating securities	0.4	0.6	0.7
Diluted weighted average common shares outstanding	568.6	565.4	585.5
Net (loss)/earnings per share:			
Basic	(\$20.88)	(\$1.12)	\$18.05
Diluted	(20.88)	(1.12)	17.85

Loss/Earnings From Operations

The following table summarizes (Loss)/earnings from operations:

(Dollars in millions)

Years ended December 31,	2020	2019	2018
Commercial Airplanes	(\$13,847)	(\$6,657)	\$7,830
Defense, Space & Security	1,539	2,615	1,692
Global Services	450	2,697	2,536
Boeing Capital	63	28	79
Segment operating (loss)/profit	(11,795)	(1,317)	12,137
Pension FAS/CAS service cost adjustment	1,024	1,071	1,005
Postretirement FAS/CAS service cost adjustment	359	344	322
Unallocated items, eliminations and other	(2,355)	(2,073)	(1,477)
(Loss)/earnings from operations (GAAP)	(\$12,767)	(\$1,975)	\$11,987
FAS/CAS service cost adjustment *	(1,383)	(1,415)	(1,327)
Core operating (loss)/earnings (Non-GAAP) **	(\$14,150)	(\$3,390)	\$10,660

Loss from operations was \$1,975 million in 2019 compared with earnings from operations of \$11,987 million in 2018. The decrease of \$13,962 million is primarily due to a loss from operations at BCA of \$6,657 million in 2019 compared to earnings from operations of \$7,830 million in 2018, partially offset by higher earnings at BDS and BGS in 2019 compared with 2018. BCA results decreased by \$14,487 million due to lower 737 deliveries and the earnings charges for estimated 737 MAX grounding customer considerations of \$8,259 million, net of insurance recoveries. BDS earnings from operations

Source: Boeing Annual Report 2020

Liquidity and Capital Resources

Cash Flow Summary

(Dollars in millions)

Years ended December 31,	2019	2018	2017
Net (loss)/earnings	(\$636)	\$10,460	\$8,458
Non-cash items	2,819	2,578	2,636
Changes in working capital	(4,629)	2,284	2,252
Net cash (used)/provided by operating activities	(2,446)	15,322	13,346
Net cash used by investing activities	(1,530)	(4,621)	(2,058)
Net cash provided/(used) by financing activities	5,739	(11,722)	(11,350)
Effect of exchange rate changes on cash and cash equivalents	(5)	(53)	80
Net increase/(decrease) in cash & cash equivalents, including restricted	1,758	(1,074)	18
Cash & cash equivalents, including restricted, at beginning of year	7,813	8,887	8,869
Cash & cash equivalents, including restricted, at end of year	\$9,571	\$7,813	\$8,887

Operating Activities Net cash used by operating activities was \$2.4 billion during 2019, compared with net cash provided by operating activities of \$15.3 billion during 2018 and \$13.3 billion in 2017. The decrease in operating cash flows in 2019 primarily reflects the impacts of the 737 MAX grounding that is resulting

in lower earnings, higher inventory and lower advances and progress payments. In addition, compensation payments to 737 MAX customers of \$1.2 billion for disruption to their operations also reduced 2019 cash from operating activities. Cash used to fund Inventory was \$12.4 billion during 2019 as we continued to produce aircraft while deliveries were suspended. Cash provided by Advances and progress billings was \$0.7 billion in 2019, as compared with \$2.6 billion in 2018. In December 2019, we announced plans to temporarily suspend production of the 737 MAX beginning in January 2020. This will enable us to prioritize the delivery of stored aircraft. Net cash from operating activities in future quarters is expected to continue to be adversely impacted by the 737 MAX grounding.

Source: Boeing Annual Report 2019

Comparison of Cumulative* Five-Year Total Shareholder Returns						
Company/Index	Base Period	Years Ending December				
	2015	2016	2017	2018	2019	2020
Boeing	100	111.32	216.82	241.82	249.86	165.17
S&P 500 Aerospace & Defense	100	118.90	168.11	154.54	201.41	169.05
S&P 500 Index	100	111.96	136.40	130.42	171.49	203.04

*Cumulative return assumes \$100 invested; Includes reinvestment of dividends.

Source: Boeing Annual Report 2020

Capital Resources The impacts of the COVID-19 pandemic and 737 MAX grounding are having a significant negative impact on our liquidity and ongoing operations and creating significant uncertainty. We have and are continuing to take significant actions to manage and preserve our liquidity. For further

During the year ended December 31, 2020, we did not repurchase any shares through our open market share repurchase program compared to repurchases of 6.9 million and 26.1 million shares in 2019 and 2018 totaling \$2.7 billion and \$9.0 billion. Share repurchases under this plan had been suspended since April 2019. In March 2020, the Board of Directors terminated its prior authorization to repurchase shares of the Company's outstanding common stock. We had 0.6 million, 0.6 million, and 0.7 million

Source: Boeing Annual report 2020

We depend, in part, upon the issuance of debt to fund our operations and contractual commitments. As of December 31, 2019 and 2018, our airplane financing commitments totaled \$13,377 and \$19,462. In addition, our debt balances increased significantly in 2019, and we expect further increases in 2020, in order to manage liquidity impacts related to the 737 MAX grounding. This has also resulted in downgrades to our credit ratings. If we require additional funding in order to fund outstanding financing commitments, address further 737 MAX impacts, or meet other business requirements, our market liquidity may not be sufficient. A number of factors could cause us to incur increased borrowing costs and to have greater difficulty accessing public and private markets for debt. These factors include disruptions or declines in the global capital markets and/or a decline in our financial performance, outlook or credit ratings, including impacts related to the 737 MAX grounding. The occurrence of any or all of these events may adversely affect our ability to fund our operations and contractual or financing commitments.

Source: Boeing Annual report 2019

STATEMENT OF ROBERT H. BINDER, ASSISTANT SECRETARY OF TRANSPORTATION FOR POLICY, PLANS AND INTERNATIONAL AFFAIRS, BEFORE THE SUBCOMMITTEE ON AVIATION OF THE HOUSE COMMITTEE ON PUBLIC WORKS AND TRANSPORTATION, ON THE EFFECTS OF THE ENERGY CRISIS ON AVIATION, JUNE 25, 1975.

Mr. Chairman and Members of the Subcommittee:

Thank you for your invitation to present the views of the Department of Transportation on matters relating to the effects of the energy crisis on aviation.

As the Committee knows, the country is running out of petroleum and it remains vulnerable to price and supply manipulation by foreign petroleum producing nations. To decrease that vulnerability, energy conservation is essential. The Committee is aware of the Administration's efforts to reduce petroleum consumption as part of its efforts to achieve energy independence for the United States by 1980. Among measures to create incentives for conservation are increases in the fees on imported petroleum and removal, or decontrol, of price ceilings on old oil to allow prices to rise gradually to a level which will discourage wasteful consumption.

As the costs of petroleum move upward, impacts are felt in all areas of the economy, but especially in transportation. Highway transportation, for example, accounts for almost 40% of our petroleum consumption. Air transportation consumes about 4.5%.

we then should consider what actions might be necessary. The transportation industry is sufficiently vital to the economic health of the country that the continuation of effective and efficient service is also an important goal. The burden of showing special circumstances rests with industry.

The Air Transport Association, in recent testimony before the Civil Aeronautics Board, painted a dire picture of the effect that certain possible increases in fuel prices will have on air carrier revenues, service schedules and employment.

While the impacts that ATA describes would be severe, it is by no means clear that all those effects will take place or that they will occur at the same time. What is clear is that ATA's projections of serious

Source: Statement of Robert H. Binder, Assistant Secretary of Transportation



Source: NTSB investigation page, which confirms JT610 crashed in the Java Sea on October 29, 2018, involving 737 MAX 8 PK-LQP

Lion Air JT610 plane crash



Ethiopian Air Line Map



Crash Site Map

Source: BBC News

1 Introduction

Corporate governance (CG) is the practices, rules, and processes that guide and govern an organisation [1]. Good CG encourages ethical conduct and guarantees that the interests of every stakeholder are harmonised, hence assisting the corporation in gaining investors and general societal trust. Poor CG leads to corporate disasters, including controversies, bankruptcy and collapses, which can cause irreparable reputation damage. The commercial world has encountered various corporate scandals that have caused severe reputational and financial harm to firms, including the Boeing 737-max scandal.

In Indonesia on October 2018, a new 737-MAX Boeing jet crashed 12 shortly after taking off, which killed all 189 onboard passengers. About five months later, another 737-max crashed Six minutes after take-off in Ethiopia, killing all 157 people onboard. With this in mind, investigations revealed that Boeing adopted a new key flight management system known as MCAS and misrepresented to regulators and the aviation industry about such modifications in order to save the business millions of dollars in pilot retraining expenses [2]. Boeing did not include a description of the MCAS in its instruction/training handbook for the new 737-Max aircraft, which was sold to carriers. A vice president of Boeing clarified that the company believed pilots were not required to understand the device since they were trained to deal with emergency scenarios, and the firm did not intend to overwhelm crew personnel with superfluous knowledge [3–6].

2 Boeing Scandal from the Corporate Governance (CG) Lens

The 737-MAX incidents harmed Boeing's credibility, which can be attributed to their disregard for proper CG. Their governance strategy centred on maximising shareholders' short-term returns. Despite delivering around 90% of operating income for shareholders, this attitude disregards the interests of other crucial stakeholders [16]. Such a governance strategy corresponds to a utilitarianism paradigm that inevitably becomes an agency conundrum [17].

Boeing provided a premature clearance of the 737-MAX, directed by such a utilitarian board. In desire of short-term profit and unhealthy rivalry with Airbus, Boeing allowed the model's distribution to the market despite that internal review showing that further necessary knowledge and training could have been given for the upgraded MCAS. The shareholders' drive for a quick profit accelerated the device certification process without a doubt [18, 19].

When shareholders delegate complete responsibility for the corporate actions to the agent (Directors and executives) and entrust them with determining what operational and corporate data should be supplied to them via agents, an agency dilemma arises [20]. As a result, stockholders will have unequal access to information [21] as in Boeing's case. Thus, according to the shareholder, Richard Seeks, the Board has prioritised financial statistics over aircraft safety, resulting in violations of securities fraud [22].

Likewise, in order to build value for shareholders, Boeing had to weigh the possibly conflicting interests of many stakeholders, including stockholders impacted by the company's actions. In an ideal world, shareholder value could be achieved by concurrently accommodating the company's four driving forces: employees, customers, vendors, and the environment [23]. Nevertheless, ignoring the concerns of other stakeholders [24], Boeing jeopardised the shareholders' positions in ways that resulted in significant economic and reputational damages.

Boeing's official values represent a framework for "Seek, Speak, & Listen" that indeed encourages employees to seek input, express warnings, and listen to one another, thereby enabling the company to acquire early warnings about errors or noncompliance (Boeing, n.d.). The governing Board, however, violated these values by prioritising profit maximisation above everything else, inflicting harm to both external as well as internal stockholders. Internally, staff were forced to meet hazardous aircraft production deadlines, despite the engineers' repeated quality and safety warnings that were ignored by the company's higher authorities [25]. The US Federal Aviation Administration (FAA) performed an audit that revealed that staff were subjected to pressure and a

Source: - Abdeldayem, M. M., Aldulaimi, S. H., Abu-AlSondos, I. A., & Baqi, A. (2023, May). Corporate governance and sustainability development goals: Boeing case study. In *Conference on Sustainability and Cutting-Edge Business Technologies* (pp. 354-366). Cham: Springer Nature Switzerland.

As noted above, with its belief that it must keep up with its main competitor, Airbus, Boeing elected to modify the latest generation of the 737 family, the 737NG, rather than design an entirely new aircraft. Yet this raised a significant engineering challenge for Boeing. Mounting larger, more fuel-efficient engines, similar to those employed on the A320neo, on the existing 737 airframe posed a serious design problem, because the 737 family was built closer to the ground than the Airbus

A320. In order to provide appropriate ground clearance, the larger engines had to be mounted higher and farther forward on the wings than previous models of the 737 (see Fig. 2). This significantly changed the aerodynamics of the aircraft and created the possibility of a nose-up stall under certain flight conditions (Travis 2019; Glanz et al. 2019).

Boeing's attempt to solve this problem involved incorporating MCAS as a software fix for the potential stall condition. The 737 was designed with two AOA sensors, one on each side of the aircraft. Yet Boeing decided that the 737 MAX would only use input from one of the plane's two AOA sensors. If the single AOA sensor was triggered, MCAS would detect a dangerous nose-up condition and send a signal to the horizontal stabilizer located in the tail. Movement of the stabilizer would then force the plane's tail up and the nose down (Travis 2019). In both the Lion Air and Ethiopian Air crashes, the AOA sensor malfunctioned, repeatedly activating MCAS

managers violated widely accepted ethical norms such as informed consent and the precautionary principle.

From an engineering perspective, the central ethical issue in the MAX case arguably circulates around the decision to use software (i.e., MCAS) to "mask" a questionable hardware design—the repositioning of the engines that disrupted the aerodynamics of the airframe (Travis 2019). As Johnston and Harris (2019) argue: "To meet the design goals and avoid an expensive hardware change, Boeing created the MCAS as a software Band-Aid." Though a reliance on software fixes often happens in this manner, it places a high burden of safety on such fixes that they may

Evidence -Herkert, J., Borenstein, J., & Miller, K. (2020). The Boeing 737 MAX: Lessons for engineering ethics. *Science and Engineering Ethics*, 26(6), 2957–2974.

5 Functions of the Board of Directors in Risk Management

In a typical corporate setting, the Key-Performance-Indicators (KPIs) and the Key-Risk-Indicators (KRIs) are always kept in a state of equilibrium with one another (KRIs). It would appear that Boeing's KPIs and KRIs were in direct competition with one another, with the financial KPIs emerging victorious. The new management teams at Boeing gave KRIs little to no attention, if any attention at all, in large part because they feared that recognising them would slow down output and therefore did not want to acknowledge them. If the new management had followed proper ethical standards and managed KRIs in the appropriate manner, they would have been able to identify and address the concerns regarding the safety of the 737-MAX [45].

The Board of Directors must play a proactive role in unearthing risks that ambitious executives may have concealed. And hence, When the KRIs are effectively managed, the Board will be able to identify possible hazards and take necessary actions to mitigate them. Staff concerns, staff under stress, simulator testing outcomes, and engineer errors are illustrations of KRIs.

From a risk-management standpoint, Boeing's executive and Boards did not safeguard the corporation, airlines, and public that utilised its aeroplanes. They appeared corrupt, and risk management procedures were disregarded. In response to the occurrences and compensatory fines imposed to prevent prosecution, the FAA approved the aeroplane certifying reform and compliance regulations, which bolstered FAA regulatory control.

Evidence -Abdeldayem, M. M., Aldulaimi, S. H., Abu-AlSondos, I. A., & Baqi, A. (2023). Corporate governance and sustainability development goals: Boeing case study. In S. G. Yaseen (Ed.), *Sustainable and cutting-edge business technologies* (pp. 354–366). Springer. https://doi.org/10.1007/978-3-031-42455-7_30

that involve safety, health, or welfare of the products under consideration. PMD or management decisions involve areas such as cost, marketing, employee morale or welfare. Engineers should not make, or be forced by management to make, unacceptable ethical or technical compromises (82).

However, as the 737 Max case exemplifies, engineers were taken out of major decisions regarding the reengineering of the 737. Managers were making aeronautical decisions based on cost cutting and sales rather than the safety of their product. Later in the paper we will explain the dangers of "silo mentality," when one arm of a company makes major decisions without considering important factors in other

 Springer

branches of the firm. In assessing the corporate culture surrounding the problems with the 737 Max, Boeing was preoccupied with efficiency and profitability and believed the demand for the reengineered plane would be strong. The demand turned out to be strong, but that encouraged speeding up the plane's production without proper testing. Pressures for these speed-ups contributed at least indirectly to the Boeing 737 MAX crashes.

This sort of preoccupation was also found in General Motors when its management ignored ignition switch failures. Problems with the ignition switch were detected in its Chevrolet Cobalt as early as 2002. But despite hundreds of injuries and fatalities from this failure, and thousands of complaints, the Company held it

could make a quick manual adjustment to save the aircraft if the sensors were malfunctioning. So, they omitted placing information in the pilots' operations manual about this feature and how to recover the aircraft if the sensors malfunctioned (Zhang 2019; Langewiesche 2019; Pasztor et al. 2019). They also omitted most simulator training for the 737 MAX pilots (Kitroeff and Gelles 2020).

In both crashes the FAA and Boeing found the MCAS to be the problem but also did not rule out pilot error as well (MacGillis 2019). But by November of 2018, Boeing was attempting to redesign the MCAS. In the meantime, the FAA and Boeing sent urgent messages to airlines to emphasize a flight recovery procedure should the MCAS malfunction (Gates 2019). Boeing initially predicted that it would take approximately six weeks to fix the MCAS's automated software problems. Within days after the devastating crash of Ethiopian flight 302, the FAA grounded the 737 MAX. It was grounded internationally as well (Levin 2019). In November of 2020, the F.A.A. lifted its 20 month ban on the Boeing 737 MAX. The European Union, Canada and Brazil are expected to follow suit as soon as pilot training procedures are in place. The flaws were determined to be in the MCAS software and also on pilot training. The F.A.A. must still approve pilot training procedures for each U.S. airline that will use the aircraft (Chokshi 2020).

Initially, simulator training for 737 MAX pilots was discouraged by Boeing because of time and expense. One of the company's big selling points with customers had been that pilots who were certified for an earlier generation of 737 jets only needed a short computer course to brush up their skills to fly the MAX (Langewiesche 2019). According to *The Wall Street Journal*, when the 737 MAX entered service in 2017, the FAA had approved the airliner, stating that the agency's "certification processes are well established and have consistently produced safe aircraft" (Tangel et al. 2019). Those assurances helped make the 737 MAX a best-selling jetliner. However, there was an additional pressure. Because of an impending sale of planes by Airbus to American Airlines, the 737 MAX was pushed to market, not waiting for approval of the design by its board of directors before the sale (Cohan). Boeing's board didn't formally sign off on the MAX until a month later." (Tangel et al. 2019).

Additional problems have surfaced since the grounding of the 737 MAX. First, a software problem prevents the flight control computers from being turned on. The second problem involves sets of wire bundles on the plane in close proximity to one

Source -Englehardt, E., Werhane, P. H., & Newton, L. H. (2021). Leadership, engineering and ethical clashes at Boeing. *Science and Engineering Ethics*, 27, Article 12.

5 Functions of the Board of Directors in Risk Management

In a typical corporate setting, the Key-Performance-Indicators (KPIs) and the Key-Risk-Indicators (KRIs) are always kept in a state of equilibrium with one another (KRIs). It would appear that Boeing's KPIs and KRIs were in direct competition with one another, with the financial KPIs emerging victorious. The new management teams at Boeing gave KRIs little to no attention, if any attention at all, in large part because they feared that recognising them would slow down output and therefore did not want to acknowledge them. If the new management had followed proper ethical standards and managed KRIs in the appropriate manner, they would have been able to identify and address the concerns regarding the safety of the 737-MAX [45].

The Board of Directors must play a proactive role in unearthing risks that ambitious executives may have concealed. And hence, When the KRIs are effectively managed, the Board will be able to identify possible hazards and take necessary actions to mitigate them. Staff concerns, staff under stress, simulator resting outcomes, and engineer errors are illustrations of KRIs.

From a risk-management standpoint, Boeing's executive and Boards did not safeguard the corporation, airlines, and public that utilised its aeroplanes. They appeared corrupt, and risk management procedures were disregarded. In response to the occurrences and compensatory fines imposed to prevent prosecution, the FAA approved the aeroplane certifying reform and compliance regulations, which bolstered FAA regulatory control.

of the company's daily management and operations as well as functioning as the board's chairman, granting him significant influence over the organization's overall strategy and decision-making [34].

The Board executed three fundamental ethical lapses in CG [35] which resulted in tragedy, massive, recurring damage to the corporation, and a \$2.5 billion loss in penalties and compensations.

The Non-consent:

Key-stakeholders should be involved in corporate operations and decision-making. Undoubtedly, the authority, carriers, and aircrew were not disclosed the new aircraft design feature when they should have [31, 36]. Those few who questioned it prior to its appearance on the market were also disregarded and mocked.

358 M. M. Abdeldayem et al.

Failure to Adhere to the Precautionary Principle:

Following the 2018 accident, Dennis Muilenburg repeatedly assured the sector, the public, the media and even the U.S. president that there had been no fault with the aircraft and that it was safe to board. In addition, they falsely claimed that the pilots were at fault for not following the right emergency protocols.

Evidence -Abdeldayem, M. M., Aldulaimi, S. H., Abu-AlSondos, I. A., & Baqi, A. (2023). Corporate governance and sustainability development goals: Boeing case study. In S. G. Yaseen (Ed.), Sustainable and cutting-edge business technologies (pp. 354–366). Springer.

MCAS – Boeing failed to appropriately classify MCAS as a safety-critical system, concealed critical information about MCAS from pilots, and sought to diminish focus on MCAS as a “new system” in order to avoid greater FAA scrutiny and increased pilot training requirements.

- Both Boeing and the FAA failed to appropriately designate MCAS a safety-critical system. In May 2019, then-Acting FAA Administrator Dan Elwell acknowledged this point at a hearing before the Committee.²⁹
- In 2012, Boeing developed initial concepts for an MCAS annunciator to inform pilots when the MCAS failed, but never implemented it.³⁰
- In June 2013, Boeing employees formulated a plan to help avoid increased FAA certification and pilot training requirements for the 737 MAX by describing MCAS as “an addition to [the existing] Speed Trim [system].”³¹ The Boeing meeting minutes, summarized in an e-mail, warned: “If we emphasize MCAS is a new function there may be a greater certification and training impact.”³² According to the e-mail that summarized the meeting minutes, a Boeing AR concurred with this plan.³³
- In 2015, a Boeing AR raised the question of whether MCAS was “vulnerable to single AOA sensor failures....”³⁴ Despite this, the aircraft was delivered with MCAS dependent on a single AOA sensor.
- After Boeing redesigned MCAS in 2016 to increase its power to move the aircraft’s stabilizer at low speed, Boeing never reevaluated a single- and multiple-failure analysis of MCAS.³⁵
- In March 2016, Boeing sought, and the FAA approved, removal of references to MCAS from Boeing’s Flight Crew Operations Manual (FCOM),³⁶ ensuring 737 MAX pilots were unaware of this new software and its potential effect on the aircraft’s handling without pilot command.

Evidence -House Committee on Transportation and Infrastructure. (2020, March). The Boeing 737 MAX aircraft: Costs, consequences, and lessons from its design, development, and certification—Preliminary investigative findings. U.S. House of Representatives.

Boeing's response after Ethiopian Airlines crash

After the Ethiopian Airlines crash, Boeing stated that the company was deeply saddened to learn of the passing of passengers and crew (March 10, 2019). Boeing responded in similar wording compared to the Lion Air crash, referring to its heartfelt sympathies and the provision of technical assistance. In neutral terms, aviation expert Robert Stengel, professor of engineering and applied sciences at Princeton University, pointed at the similarities. He stated "If you're simply looking at circumstantial evidence, this gives you a pause, doesn't it?" (Supplemental Appendix, statement 29). Soon after, China and Indonesia started to ground Boeing 737-Max aircrafts, followed by Ethiopian Airlines. The FAA did not want to jump to conclusions and told the *New York Times* that the investigation had only just begun. As passengers and pilots started to share their doubts, Boeing repeated that pilots would always be able to override the flight control, even

On March 18, 2019, Boeing released a statement which reminded the public of their expertise and commitment to safety. Relatives of the Lion Air crash appeared in the media and held Boeing accountable for the accident. They filed a lawsuit, claiming that "The plane was defective and in a condition that rendered it unreasonably dangerous for its intended use" (Supplemental Appendix, statement 94). In statement 111 (Supplemental Appendix), they express their disappointment in the company, as Boeing did not learn from the first incident. According to the relatives, it is "absolutely inexcusable that it takes another crash for people to kick this investigation and improvements into high gear."

Indonesia's top aviation regulatory official and aviation experts stated that both Boeing and the FAA were slow in responding to requests on April 2, 2019. He referred to them as *The Americans* (Supplemental Appendix, statement 114). A spokesperson for

Source: Springer



Boeing has reported its worst annual orders in at least two decades - as it remains in crisis over its 737 Max model.

The company also said deliveries of its planes slumped to an 11-year low last year.

It means the US firm has lost its title as the world's biggest plane maker to European rival Airbus.

The 737 Max has been grounded since March after two crashes in which 346 people were killed.

Boeing said net orders after cancellations for 2019 totalled just 54 planes. That compares with 893 the previous year.

At the same time deliveries fell by 53% to 380 planes, the lowest number since 2007.

Source: BBC News

737 MAX 2021 MILESTONES				
Global regulators and aviation organizations from around the world collaborated to allow the airplane to safely return to service.	JANUARY	FEBRUARY	MARCH	
	European Union Aviation Safety Agency (EASA) and U.K. Civil Aviation Authority approvals for 737 MAX return to service	- Air Canada, United Airlines and TUI return 737 MAX to service - UAE General Civil Aviation Authority approval	- Australia Civil Aviation Safety Authority approval - Alaska Airlines introduces 737 MAX into service - Southwest Airlines returns 737 MAX to service	- Investment firm 777 Partners orders 24 737-8s - Southwest Airlines orders 100 737-7s and 737-8s - Federal Aviation Administration certifies 737-8-2s

Source: Boeing Annual Report 2021

13.2 Safety Issue #2: MCAS Reset Generates Repetitive MCAS Commands

In the original design, when a continuous erroneous high AOA sensor value exists, the MCAS control law uses pilot release of the electric trim switch to reset MCAS activation. Once reset the MCAS system will make another airplane nose-down stabilizer trim command after five seconds. This scenario repeats each time the MCAS makes a command and the pilot makes an electric trim command of any duration and releases the trim switch. In the new design, Boeing included flight control law changes to ensure that MCAS will not command repeated movements of the horizontal stabilizer. The revised flight control laws would permit only one activation of MCAS per sensed high-AOA event. A subsequent activation of MCAS would only be possible after the airplane returns to a low-AOA state, below the threshold that would cause MCAS activation.

13.3 Safety Issue #3 MCAS Trim Authority

In the original design, all MCAS commands were incremental commands, which moved the horizontal stabilizer a fixed amount, regardless of the current position of the stabilizer. Therefore, multiple MCAS commands resulted in a significant horizontal stabilizer mistrim condition which the flightcrew could not counter using only elevator control. In the new design, Boeing included flight control law changes that limit the magnitude of any MCAS command to move the horizontal stabilizer, such that the final horizontal stabilizer position (after the MCAS command) would preserve the flightcrew's ability to control the airplane pitch by using only the control column.

Source: Federal Aviation Administration

Item 2. Properties

Aircraft

Southwest operated a total of 803 Boeing 737 aircraft as of December 31, 2025, of which 82 and 15 were under operating and finance leases, respectively. The following table details information on the 803 aircraft as of December 31, 2025:

Type	Seats	Average Age (Yrs)	Number of Aircraft	Number Owned	Number Leased (a)
737-700	143(b)	20	305	286	19
737-800	175	10	198	149	49
737 -8	175	3	300	271	29
Totals		11	803	706	97

(a) See Note 7 to the Consolidated Financial Statements for more information on the Company's lease transactions.

(b) In January 2026, the Company completed retrofits on its -700 fleet to reduce the number of seats to 137 in connection with its implementation of extra legroom seating.

Source: Southwest Airlines (America)

airfleets.net			
Scroll tab to view all data			
AIRCRAFT	CURRENT FLEET		
	ACTIVE	PARKED	
Airbus A330			
Airbus A330-200			
Airbus A350	26		
Airbus A350-1000	4		
Airbus A350-900	22		
ATR 42/72	2		
ATR 42			
ATR 72	2		
Boeing 737			
Boeing 737-200			
Boeing 737-400			
Boeing 737 NG / Max	37		
Boeing 737-700	2		
Boeing 737-800	12		
Boeing 737-MAX 8	23		
Boeing 757			
Boeing 757-200			
Boeing 767	2		
Boeing 767-200			
Boeing 767-300	2		
Boeing 777	21	2	
Boeing 777-200	4	2	
Boeing 777-300	5		
Boeing 777-Freighter	12		
Boeing 787	30		
Boeing 787-8	20		



English

About Us

Our Fleet

In 2000 following our establishment, Lion Air proudly rolled out a fleet of just two Boeing 737-200 aircraft. Today, we have 118 -- including the Boeing 737-900ER, Boeing 737-800, Boeing 737 MAX 8 and Airbus A330-300 -- to meet passenger demand.

Our fleet is one of the newest in the business, and we have taken the initiative to partner with internationally recognized organisations including OEMs (Boeing, Airbus, Honeywell), export credit agencies (EXIM, ECA), Banks (DBJ, BNP, Citi) and Lessors (GECAS, BOCA, Avolon) to improve our processes, including safety practices.

Ours is a high-capacity and largely uniform fleet that is also fuel-efficient and with an average age of just 6.73 years. Such a young fleet of predominantly Boeing 737 family aircraft delivers efficiencies, including low maintenance costs and operational reliability, which are a win-win for Lion Air and our passengers.

Our aircraft configurations maximise space and seat availability but with the onus on crating the very best on-board experience.

Source: Lion Air & Ethiopian Airlines

The following comments, which address several findings in the EAB's final report, supplement the comments that the NTSB released on December 27, 2022.⁴

EAB Finding Nos. 20, 50, 54, 55, 64, and 65

The above-mentioned findings in the final report state the following:

20. Post-accident analysis reveals (the) new Airplane (the Boeing 737 MAX) experienced unexplained electrical and electronic faults within weeks of entering service, and in the weeks and days prior to their accidents.¹

50. MCAS and the lack of pilot training did not trigger the accident; however it was the failure of the sensors due to the production quality defects. If the intermittent defects did not cause the AOA Sensors to fail on the accident flight, MCAS would not have activated, and the accident would not have occurred. The MCAS would have remained as (a) hidden threat until its true nature is exposed by some other valid or erroneous causes.

54. The failure of originally installed and tested Boeing AOA Sensor parts (were) associated with fatal plane crashes likely involving an open circuit, wire fatigue, evidence of multiple arcing events, unexplained electrical/electronic anomalies, and the loss of heater power.⁴

Source: National Transportation Safety Board USA

The Fuel Equation

The 737 MAX, for all its troubled history, is a genuinely more-efficient aircraft than the 737 NG it replaces. The LEAP-1B engines burn approximately 14-15 percent less fuel per seat than the previous generation. For an airline operating hundreds of flights per day, that fuel saving translates directly to the bottom line. Fuel typically accounts for 25-30 percent of an airline's operating costs. Even a single percentage-point improvement matters enormously at scale.

Airlines that delay taking MAX deliveries are effectively choosing to burn more fuel every day their older aircraft remain in service. In an era of volatility of prices and growing environmental scrutiny, that is a decision no airline wants to make for longer than necessary.

The Safety Calculation

This is the plot that makes passengers uncomfortable, but it's how airlines think about risk. The 737 MAX was grounded worldwide for nearly two years after the crashes of Lion Air Flight 610 and Ethiopian Airlines Flight 302. During that period, the MCAS system that caused both crashes was redesigned, new pilot-training requirements were implemented, and the aircraft underwent the most extensive re-certification process in commercial aviation history.

Airlines looking at the MAX today see an aircraft that has been scrutinized more thoroughly than any other plane currently flying. The post-grounding MAX has accumulated millions of flight hours



Source: MigFlug ("The Fuel Equation")



Source: Boeing

Why Emirates Doesn't Want The Boeing 737 MAX

By Alexander Mitchell — Published Mar 25, 2020, 5:01 PM EDT

Alexander (Alex) Mitchell came to Simple Flying with a background in finance and strategy consulting. He has covered airlines and aerospace at Bridgewater Associates, the world's largest hedge fund, and served major industry clients as a Summer Associate at the Boston Consulting Group...

Upon first glance, the Boeing 737 MAX seems like an aircraft that almost any major airline would want. It is fuel-efficient, flexible, and capable of serving a huge range of short- and medium-haul markets with strong operating economics. But Emirates is not just any airline. The Dubai-based carrier has managed to build its identity around a very different operating philosophy. The carrier moves large numbers of long-haul passengers through one massive global hub using widebody aircraft rather than scattering capacity across a number of smaller jets. In that context, the Boeing 737 MAX is not a missing piece that would add strength to the carrier's overall network strategy. Rather, it is an aircraft that solves a problem Emirates never really had in the first place.

See more Simple Flying stories

Add us on Google

Remove Ads

SIXT

PAY NOW. PAY LATER



Source: Cockpit King (Facebook post on Southwest)

Top Content / Business Strategy / Cost Reduction Techniques /

Strategies Airlines Use to Reduce Costs

Explore top LinkedIn content from expert professionals.

Summary

Airlines use targeted strategies to reduce costs by simplifying their operations and streamlining processes, helping them stay profitable even in competitive markets. Cost reduction strategies are focused plans and decisions that make an airline's daily work more efficient and less expensive without sacrificing service or safety.

- **Streamline fleet:** Using one type of aircraft across the fleet lowers training, maintenance, and inventory costs by making operations simpler and faster for staff.
- **Simplify services:** Eliminating extras like meals and assigned seating speeds up aircraft turnaround times and reduces expenses tied to catering and cleaning.
- **Standardize operations:** Creating consistent procedures and routines across the airline helps identify and remove inefficiencies, leading to significant savings.

Summarized by AI based on LinkedIn member posts

BIG ORDER

Turkish Airlines could buy up to 225 Boeing planes

Turkish Airlines confirmed in a statement to investors that it was in talks with US-based Boeing for an order of 225 aircraft.

On September 26, 2025, the Turkish national airline announced that its board of directors had placed a firm order for 50 Boeing 787 Dreamliner aircraft, which were 787-8s and 787-9s, with options for an additional 25. "Negotiations are ongoing with Rolls-Royce and GE Aerospace for the purchase of aircraft engines, spare engines and engine maintenance services," Turkish Airlines wrote.

Boeing later confirmed in its own press release that the deal includes 35 787-9s and 15 larger 787-10s.

"This landmark agreement is much more than a fleet expansion. It reflects our industry leadership and our commitment to innovation and operational excellence," said Professor Ahmet Bolat, Chairman of the Board of Directors and Executive Committee of Turkish Airlines.

He added, "The addition of these advanced Boeing aircraft to our fleet will not only enhance our operational capabilities, but will also become a significant element in supporting Turkish Airlines' 2033 vision of expanding our fleet to 800 aircraft."

In addition, Turkish Airlines has agreed to purchase 100 737 MAX aircraft – 737-8 and 737-10 – from Boeing, with an option to purchase an additional 50 aircraft in the future. While the airline confirmed that talks with Boeing for the MAX aircraft have been concluded, the final order is subject to negotiations with engine manufacturer CFM International. Once finalized, the 737 MAX order will be Turkish Airlines' largest single-aisle Boeing order.

Source: Turkish Airlines big-order report — 787 + 737 MAX combo order



The image is a screenshot of a Facebook post from 'Aviation Voice', dated 30 January. The post text states: 'Air India has placed an additional order for 30 Boeing 737 MAX aircraft, comprising 20 737-8s and 10 737-10s, exercising existing options.' Below the text is a photograph of four men in business attire standing in front of a large Boeing aircraft. The man on the far right is shaking hands with the man next to him. A large 'BOEING' logo is visible in the background of the photo. Below the photo, there is a blue banner with white text that repeats the order details: 'Air India has placed an additional order for 30 Boeing 737 MAX aircraft, comprising 20 737-8s and 10 737-10s, exercising existing options. The deal raises Air India's Boeing backlog to nearly 200 aircraft.' At the bottom of the post, there are logos for 'SRI LANKA'S TRAVEL TRENDSETTER' and 'TravelMO'.

Source: Aviation Voice (FB) — Air India's 30-jet order, Jan 2026



The image is a screenshot of a FlightRadar24 article. The headline reads: 'Akasa, Asia's first 737-8-200 MAX operator is growing fast'. Below the headline, it says 'Subashini Pillai' and 'Updated: July 16, 2025'. The article text begins: 'India's youngest major airline is growing — fast. Akasa Air has just taken delivery of its 40th Boeing 737 MAX, reaching another milestone in line of the world's largest domestic aviation markets. With nearly 200 737 MAX aircraft still on order, the Mumbai-based carrier is building not just a fleet, but a long-term challenge to India's established domestic airlines.' To the right of the article, there is a 'Trending articles' section with a thumbnail image and the text 'July 2026: a record setting month for flight'. At the bottom of the article, there is a 'Add to us as a preferred source' button.

FlightRadar24 — Akasa Air's 40th MAX delivery

Operator	737 MAX 10 Orders (Per aircraft)
Air India Express	50
Akasa Air	44
Avia Airlines	100
American Airlines	110
Delta Air Lines	100
Emirates	10
Etihad	20
Flightright	10
ITA	20
Jet Airways	10
Qatar Airways	10
Southwest	10
United	10
Virgin Atlantic	10
Wizz Air	10
Yemen Airways	10

Source: ch-aviation — Air India Express holds 50 MAX 10 orders

Emirates

Help and contacts

Your questions

Search flights

About the Emirates Group

The Emirates network

The Emirates Group Careers

Complaints and feedback process

Where do we fly

Privacy and data protection

Working with Emirates

Emirates Leisure Retail is a subsidiary of the Emirates Group, which represents much loved food and beverage brands and outlets like Costa, Pret A Manger and Giraffe World Kitchen.

We also provide world-class training at the Emirates Flight Training Academy and Emirates CAE Flight Training among others.

You can browse through our full list of global brands here

When was Emirates founded?

We first took off from Dubai, UAE, in 1985 with just two aircraft. Today, we fly to over 150 destinations across six continents with the world's largest fleet of Airbus A380s and Boeing 777s.

Source: Source: Official Emirates Help session <https://www.emirates.com/lk/english/help/faq-topics/about-emirates/>

The Emirates fleet strategy is unusually clear by the standards of modern airlines. Customers should stay focused on large widebody aircraft and build scale through Dubai International Airport (DXB). The ultimate purpose is to avoid unnecessary complexity by pretty much any means possible. For decades, that approach has meant that the airline has relied exclusively on the Boeing 777 and the Airbus A380 to funnel traffic from across the world into a singular super-hub, a place where passengers connect onward to Europe, Asia, Africa, Australia, and the Americas.

Ad

Even as the fleet continues to evolve, the overall philosophy has not. The Airbus A350 has now joined the fleet, and more Boeing 777X aircraft are on order. Emirates has also added to its 787 commitments, but all of those moves reinforce the same long-haul, high-capacity model rather than replace it with a narrowbody strategy. This is why the Boeing 737 MAX sits outside the plan. Emirates prefers fleet commonality, premium consistency, and high seat counts on trunk routes.

Industry analysis — Emirates' DXB-centred widebody strategy

51

Item 2. Properties

We occupied approximately 86 million square feet of floor space on December 31, 2019 for manufacturing, warehousing, engineering, administration and other productive uses, of which approximately 93% was located in the United States. The following table provides a summary of the floor space by business as of December 31, 2019:

(Square feet in thousands)	Owned	Leased	Government Owned ⁽¹⁾	Total
Commercial Airplanes	41,098	2,471		43,569
Defense, Space & Security	23,401	5,651		29,052
Global Services	686	7,596		8,282
Other ⁽²⁾	2,504	2,214	316	5,036
Total	67,689	17,932	316	85,939

⁽¹⁾ Excludes rent-free space furnished by U.S. government landlord of 49 square feet.

⁽²⁾ Other includes BCC, sites used for common internal services, and our Corporate Headquarters.

Strategic Partnership with Embraer

On July 5, 2018, we and Embraer S.A. (Embraer) announced the signing of a Memorandum of Understanding to establish a strategic partnership between the two companies. On December 17, 2018, the terms of the strategic partnership were agreed by both companies. The agreed terms define the joint venture comprising the commercial aircraft and services operations of Embraer, in which Boeing will acquire an 80 percent ownership stake for \$4.2 billion. The companies have also agreed to the terms of another joint venture to promote and develop new markets for the multi-mission medium airlift KC-390, in which Boeing will hold a 49 percent ownership stake. On January 10, 2019, the Government of Brazil reviewed the terms of the strategic partnership and advised it would not exercise its Golden Share veto power, allowing the transaction to move forward. On January 11, 2019, the Embraer Board of Directors ratified its prior approval of the strategic partnership and authorized execution of the definitive transaction documents. On January 24, 2019, the definitive transaction documents were executed. The transaction remains subject to Embraer shareholder and regulatory approvals, as well as other customary closing conditions. Assuming approvals are received in a timely manner, the transaction is intended to close by

Intellectual Property

We own numerous patents and have licenses for the use of patents owned by others, which relate to our products and their manufacture. In addition to owning a large portfolio of intellectual property, we also license intellectual property to and from third parties. For example, the U.S. government has licenses in our patents that are developed in performance of government contracts, and it may use or authorize others to use the inventions covered by such patents for government purposes. Unpatented research, development and engineering skills, as well as certain trademarks, trade secrets, and other intellectual property rights, also make an important contribution to our business. While our intellectual property rights in the aggregate are important to the operation of each of our businesses, we do not believe that our business would be materially affected by the expiration of any particular intellectual property right or termination of any particular intellectual property patent license agreement.

Source: Boeing Annual Report, 2018, Boeing Annual Report, 2019.

Unauthorized access to our or our customers' information and systems could negatively impact our business.

We face certain security threats, including threats to the confidentiality, availability and integrity of our data and systems. We maintain an extensive network of technical security controls, policy enforcement mechanisms, monitoring systems and management oversight in order to address these threats. While these measures are designed to prevent, detect and respond to unauthorized activity in our systems, certain types of attacks, including cyberattacks, could result in significant financial or information losses and/or reputational harm. In addition, we manage information and information technology systems for certain customers. Many of these customers face similar security threats. If we cannot prevent the unauthorized access, release and/or corruption of our customers' confidential, classified or personally identifiable information, our reputation could be damaged, and/or we could face financial losses.

The outcome of litigation and of government inquiries and investigations involving our business is unpredictable and an adverse decision in any such matter could have a material effect on our financial position and results of operations.

We are involved in a number of litigation matters. These matters may divert financial and management resources that would otherwise be used to benefit our operations. No assurances can be given that the results of these matters will be favorable to us. An adverse resolution of any of these lawsuits, or future lawsuits, could have a material impact on our financial position and results of operations. In addition, we

Business disruptions could seriously affect our future sales and financial condition or increase our costs and expenses.

Our business may be impacted by disruptions including threats to physical security, information technology or cyber-attacks or failures, damaging weather or other acts of nature and pandemics or other public health crises. Any of these disruptions could affect our internal operations or our ability to deliver products and services to our customers. Any significant production delays, or any destruction, manipulation or improper use of our data, information systems or networks could impact our sales, increase our expenses and/or have an adverse effect on the reputation of Boeing and of our products and services.

Some of our and our suppliers' workforces are represented by labor unions, which may lead to work stoppages.

Approximately 57,000 employees, which constitute 35% of our total workforce, were union represented as of December 31, 2019. We experienced a work stoppage in 2008 when a labor strike halted commercial aircraft and certain BCS program production. We may experience additional work stoppages in the future, which could adversely affect our business. We cannot predict how stable our relationships, currently with 11 U.S. labor organizations and 13 non-U.S. labor organizations, will be or whether we will be able to meet the unions' requirements without impacting our financial condition. The unions may also limit our flexibility in dealing with our workforce. Union actions at suppliers can also affect us. Work stoppages and instability in our union relationships could delay the production and/or development of our products, which could strain relationships with customers and cause a loss of revenues which would adversely affect our operations.

Substantial pension and other postretirement benefit obligations have a material impact on our earnings, shareholders' equity and cash flows from operations, and could have significant adverse impacts in future periods.

The majority of our employees have earned benefits under defined benefit pension plans. Potential pension contributions include both mandatory amounts required under the Employee Retirement Income Security Act and discretionary contributions to improve the plans' funded status. The extent of future contributions depends heavily on market factors such as the discount rate and the actual return on plan assets. We estimate future contributions to these plans using assumptions with respect to these and other items. Changes to those assumptions could have a significant effect on future contributions as well as on our annual pension costs and/or result in a significant change to shareholders' equity. For U.S. government contracts, we allocate pension costs to individual contracts based on U.S. Cost Accounting Standards.

Source: Boeing Annual Report, 2019, FAA JATR Report, 2019, U.S. House Committee Report, 2020

Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations

Consolidated Results of Operations and Financial Condition

Overview

We are a global market leader in the design, development, manufacture, sale, service and support of commercial jetliners, military aircraft, satellites, reusable defense, human space flight and launch systems and services. We are one of the two major manufacturers of 100+ seat airplanes for the worldwide commercial airline industry and one of the largest defense contractors in the U.S. While our principal operations are in the U.S., we conduct operations in an expanding number of countries and rely on an extensive network of non-U.S. partners, key suppliers and subcontractors.

Our strategy is centered on successful execution in healthy core businesses — Commercial Airplanes (CA), Defense, Space & Security (DSS), and Global Services (GDS) — supplemented and supported by Boeing Capital (BC). Taken together, these core businesses have historically generated substantial earnings and cash flow that permit us to invest in new products and services. We focus on producing the products and providing the services that the market demands, and continue to find new ways to improve efficiency and quality to provide a fair return for our shareholders. CA is committed to being the leader in commercial aviation by offering airplanes and services that deliver superior design, safety, efficiency and value to customers around the world. DSS integrates its resources in defense, intelligence, communications, security, space and services to deliver capability-driven solutions to customers at reduced costs. Our GDS strategy is to leverage our core businesses to capture key next-generation programs while expanding our presence in adjacent and international markets, underscored by an intense focus on growth and productivity. GDS provides support for commercial and defense through innovative, comprehensive, and cost-competitive product and service solutions. BC facilitates, arranges, structures and provides selective financing solutions for our Boeing customers.

On March 13, 2018, the Federal Aviation Administration (FAA) issued an order to suspend operations of all 737 MAX aircraft in the U.S. and by U.S. aircraft operators following two fatal 737 MAX accidents. Non-U.S. civil aviation authorities have issued directives to the same effect. Delivery of the 737 MAX have been suspended until clearance is granted by the appropriate regulatory authorities. The grounding is having a significant adverse impact on our operations and creates significant uncertainty. We are focused on safely returning the 737 MAX to service.

also result in lower tariffs. We continue to monitor the potential for any extra costs that may result from the remaining global tariffs.

Since 2018, the U.S. and China imposed tariffs on approximately \$34 billion of each other's exports in July 2018. Certain aircraft parts and components that Boeing procures are subject to these tariffs. Subsequently, the U.S. imposed tariffs on an additional \$216 billion in Chinese goods, and China imposed tariffs on an additional \$76 billion worth of U.S. goods. The U.S. and China Phase I agreement in January 2020 is a positive development for overall trade with China. Negotiations to resolve remaining trade issues continue.

Overall global trade tensions and increased market uncertainty have resulted in fewer orders than anticipated for our commercial aircraft.

The U.S. Government continues to impose and/or consider imposing sanctions on certain businesses and individuals in Russia. Although our operations or sales in Russia have not been impacted to date, we continue to monitor additional sanctions that may be imposed by the U.S. Government and any responses from Russia that could affect our supply chain, business partners or customers.

Segment Results of Operations and Financial Condition

Commercial Airplanes

Business Environment and Trends

Airline Industry Environment Global economic growth, a primary driver for air travel, was 4.6% in 2019, slightly below the long-term average of approximately 5%. Passenger traffic is estimated to grow by 4% to 5% in 2019, close to the long-term average of approximately 5%. The grounding of the 737 MAX and suspension of 737 MAX deliveries has slowed growth at certain airlines. While growth was solid across most major world regions, there continues to be variation between regions and airline business models. Despite some moderation in the growth rates, airlines operating in Asia Pacific and Europe, as well as low-cost carriers globally, are leading the 2019 growth in passenger traffic. Air cargo traffic growth is expected to contract this year due to weak global trade growth.

Airline financial performance also plays a role in the demand for new capacity. Airlines continue to focus on increasing revenue through alliances, partnerships, new marketing initiatives, and effective leveraging of ancillary services and related revenues. Airlines are also focusing on reducing costs and renewing fleets to acquire more efficient airplanes. Net profits in 2019 are expected to approximate \$20 billion.

The long-term outlook for the industry continues to remain positive due to the fundamental drivers of air travel demand: economic growth and the increasing propensity to travel due to increased trade, globalization, and improved airline services driven by liberalization of air traffic rights between countries. Our 20-year forecast projects a long-term average growth rate of 4.6% per year for passenger traffic and 4.2% for cargo traffic. Based on long-term global economic growth projections of 2.7% average annual GDP growth, we project a \$6.8 trillion market for approximately 44,000 new airplanes over the next 20 years. The industry remains vulnerable to exogenous developments including fuel price spikes, credit market shocks, acts of terrorist nature disasters, conflicts, epidemics and increased global environmental regulations.

Investments

Time deposits are held-to-maturity investments that are carried at cost.

Available-for-sale debt securities include commercial paper, U.S. government agency securities, and corporate debt securities. Available-for-sale debt securities are recorded at fair value, and unrealized gains and losses are recorded, net of tax, as a component of accumulated other comprehensive income. Realized gains and losses on available-for-sale debt securities are recognized based on the specific identification method. Available-for-sale debt securities are assessed for impairment quarterly.

The equity method of accounting is used to account for investments for which we have the ability to exercise significant influence, but not control, over an investee. Significant influence is generally deemed to exist if we have an ownership interest in the voting stock of an investee of between 20% and 50%. The cumulative earnings approach is used for cash flow classification of distributions received from equity method investments.

Other Equity investments are recorded at fair value, with gains and losses recorded through net earnings. Equity investments without readily determinable fair value are measured at cost, less impairments, plus or minus observable price changes. Equity investments without readily determinable fair value are assessed for impairment quarterly.

We classify investment income and loss on our Consolidated Statements of Operations based on whether the investment is operating or non-operating in nature. Operating investments align strategically and are integrated with our operations. Earnings from operating investments, including our share of income or loss from equity method investments, dividend income from other equity investments, and any impairments or gain/loss on the disposition of these investments, are recorded in Income from operating investments, net. Non-operating investments are those we hold for non-strategic purposes. Earnings from non-operating investments, including interest and dividends on marketable securities, and any impairments or gain/loss on the disposition of these investments are recorded in Other income/(loss), net.

Evidence: Boeing Annual Report, 2018, 2019, 2020

Risk Management In managing the plan assets, we review and manage risk associated with funded status risk, interest rate risk, market risk, counterparty risk, liquidity risk and operational risk. Liability matching and asset class diversification are central to our risk management approach and are integral to the overall investment strategy. Further, asset classes are constructed to achieve diversification by investment strategy, by investment manager, by industry or sector and by holding. Investment manager guidelines for publicly traded assets are specified and are monitored regularly through the custodian. Credit parameters for counterparties have been established for managers permitted to trade over-the-counter derivatives. Valuation is governed through several types of procedures, including reviews of manager valuation policies, custodian valuation processes, pricing vendor practices, pricing reconciliation, and periodic, security-specific valuation testing.

Item 1A. Risk Factors

An investment in our common stock or debt securities involves risks and uncertainties and our actual results and future trends may differ materially from our past or projected future performance. We urge investors to consider carefully the risk factors described below in evaluating the information contained in this report.

The 737 MAX fleet is currently grounded, and we have temporarily suspended production of the 737 MAX. We are subject to a number of risks and uncertainties related to the 737 MAX. These risks include uncertainties regarding the timing and conditions of 737 MAX regulatory approvals, delays in the resumption of production, lower than planned production rates and/or delivery rates, increased considerations to customers, increased supplier costs and supply chain health, changes to the assumptions and estimates made in our financial statements regarding the 737 program, and potential outcomes of various 737 MAX-related legal proceedings and government investigations.

On March 13, 2019, the Federal Aviation Administration (FAA) issued an order to suspend operations of all 737 MAX aircraft in the U.S. and by U.S. aircraft operators following two fatal 737 MAX accidents. Non-U.S. civil aviation authorities have issued directives to the same effect. Deliveries of the 737 MAX have been suspended until clearance is granted by the appropriate regulatory authorities. The grounding has reduced revenues, operating margins, and cash flows, and will continue to do so until production and deliveries resume and production rates return to pre-grounding levels. In connection with the effort to return the 737 MAX to service, we have developed software updates for the 737 MAX, together with an associated pilot training and supplementary education program. We continue to work with the FAA and other non-U.S. civil aviation authorities to complete remaining steps toward certification and readiness for return to service, including addressing their questions on the software updates and how pilots will interact with the airplane controls and displays in different flight scenarios. Any delays in certification and/or the resumption of deliveries or other liabilities associated with the accidents or grounding could have a material adverse effect on our financial position, results of operations, and/or cash flows. In addition, multiple legal actions have been filed against us related to the 737 MAX. We also are fully cooperating with U.S. government investigations related to the accidents and the 737 MAX, including investigations by the U.S. Department of Justice and the Securities and Exchange Commission. Any adverse results with respect to any such litigation or investigation could have a further material impact on our financial position, results of operations and/or cash flows.

Unauthorized access to our or our customers' information and systems could negatively impact our business.

We face certain security threats, including threats to the confidentiality, availability and integrity of our data and systems. We maintain an extensive network of technical security controls, policy enforcement mechanisms, monitoring systems and management oversight in order to address these threats. While these measures are designed to prevent, detect and respond to unauthorized activity in our systems, certain types of attacks, including cyberattacks, could result in significant financial or information losses and/or reputational harm. In addition, we manage information and information technology systems for certain customers. Many of these customers face similar security threats. If we cannot prevent the unauthorized access, release and/or corruption of our customers' confidential, classified or personally identifiable information, our reputation could be damaged, and/or we could face financial losses.

The outcome of litigation and of government inquiries and investigations involving our business is unpredictable and an adverse decision in any such matter could have a material effect on our financial position and results of operations.

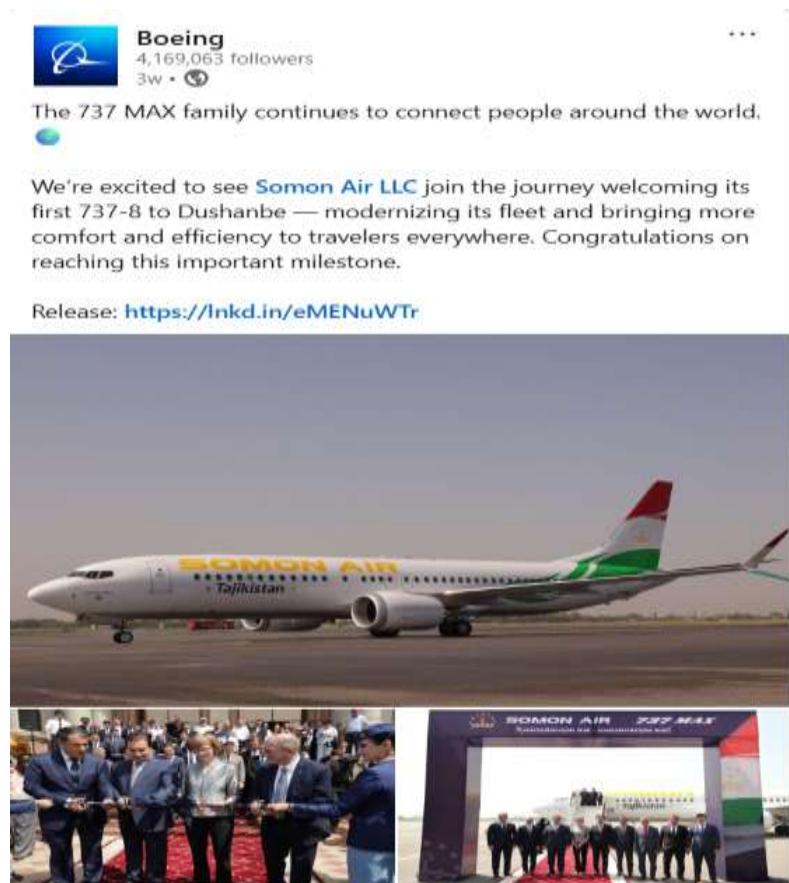
We are involved in a number of litigation matters. These matters may divert financial and management resources that would otherwise be used to benefit our operations. No assurances can be given that the results of these matters will be favorable to us. An adverse resolution of any of these lawsuits, or future lawsuits, could have a material impact on our financial position and results of operations. In addition, we

Source: Boeing Annual Report, 2019, 2020

Summary of the FAA's Review of the Boeing 737 MAX

completed all scheduled tasks as planned. The JOEB determined that all design changes applicable to the 737 MAX are operationally suitable. The Board's evaluations also included assessments of Boeing's proposed differences training and return to service training. The joint authorities, through evaluations of multiple crews from a globally diverse pilot group, determined that the proposed training by the applicant was acceptable. The FAA posted the draft 737 Flight Standardization Board (FSB) report for public comment on October 6, 2020. The comment period closed on November 2, 2020 and the FAA considered all comments made adjustments to the FSB report for clarity where needed. The FAA published the final version of the 737 FSB report, revision 17, on November 18, 2020. The final version adds training requirements for the MCAS, Autopilot Flight Director System (AFDS) enhancements, and additional Special Emphasis Training. The FAA added Appendix 7 to delineate 737 MAX ground and flight training necessary to operate the 737 MAX modified with the new FCC software. You can view the final report on [this page](#).

Source: Summary of the FAA's Review of the Boeing 737 MAX



Source: Boeing Official LinkedIn Page 2026 August

Group Members

Name	Reg No
H.M.D.N. Bandara	2022/C/023
K.W.D.I. Thilakaratha	2022/C/046
M.H.M Hasni	2022/C/055
P.K.L.W. Karunapala	2022/C/065
R.A.R.M Ranasingha	2022/C/068
S.Tharsan	2022/C/079
W.M.T.D. Wasala	2022/C/094
W.G.E.N. Herath	2022/C/095
T.G.S.K Senaratne	2022/C/106
A. Dayabaran	2022/C/110
M.F.A Aaysha	2022/C/123
R.P.S.A Nimhari	2022/C/134