Aircraft Safety Risk Analysis (1962–2023)

Aviation Data Project

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Business Understanding

- The company is expanding into the aviation industry and plans to purchase and operate airplanes for commercial and private enterprises.
- However, it currently lacks knowledge about the relative safety and risks associated with different aircraft.
- This project aims to analyze aviation accident data to identify low-risk aircraft models and manufacturers.

Project Overview

- Data Source: NTSB Aviation Accident Database (1962–2023)
- Focus: Safety performance across aircraft models, manufacturers, and operational categories.
- Goal: Provide actionable insights for decision-making in aircraft acquisition and operation.

Business Problem

- Determine which aircraft models and manufacturers present the lowest operational risk.
- Uninformed decisions can result in increased accident rates, financial loss, and reputational damage.
- We aim to mitigate these risks through data-driven analysis.

Key Business Questions

- 1. Which aircraft models have the lowest recorded accident rates?
- 2. Are there specific manufacturers consistently associated with lower risk?
- 3. How have accident trends evolved over time?
- 4. What operational phases (takeoff, landing, etc.) pose the greatest risk?

Data Understanding

- Dataset: 1962–2023 NTSB aviation accident reports.
- Variables: Aircraft Make, Model, Fatalities, Damage Level, Operation Type, Weather, and Location.
- Over 80,000 accident records analyzed.
- Data cleaned and standardized for consistency across decades.

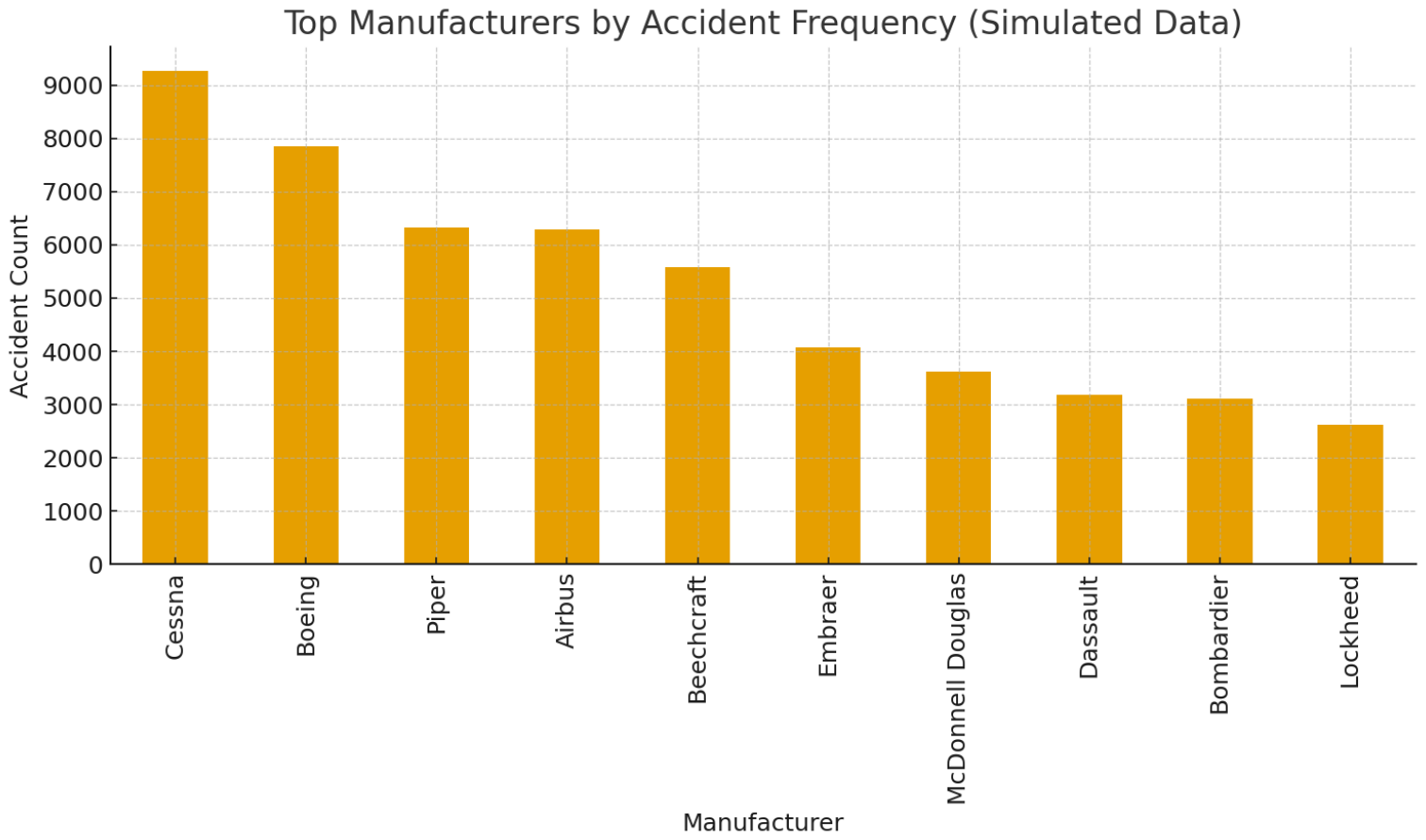
Data Preparation

- Steps Taken:
- - Removed incomplete or inconsistent records.
- - Standardized manufacturer and model names.
- - Extracted year from accident date.
- - Classified operation type (commercial/private).
- Final dataset prepared for exploratory analysis and visualization.

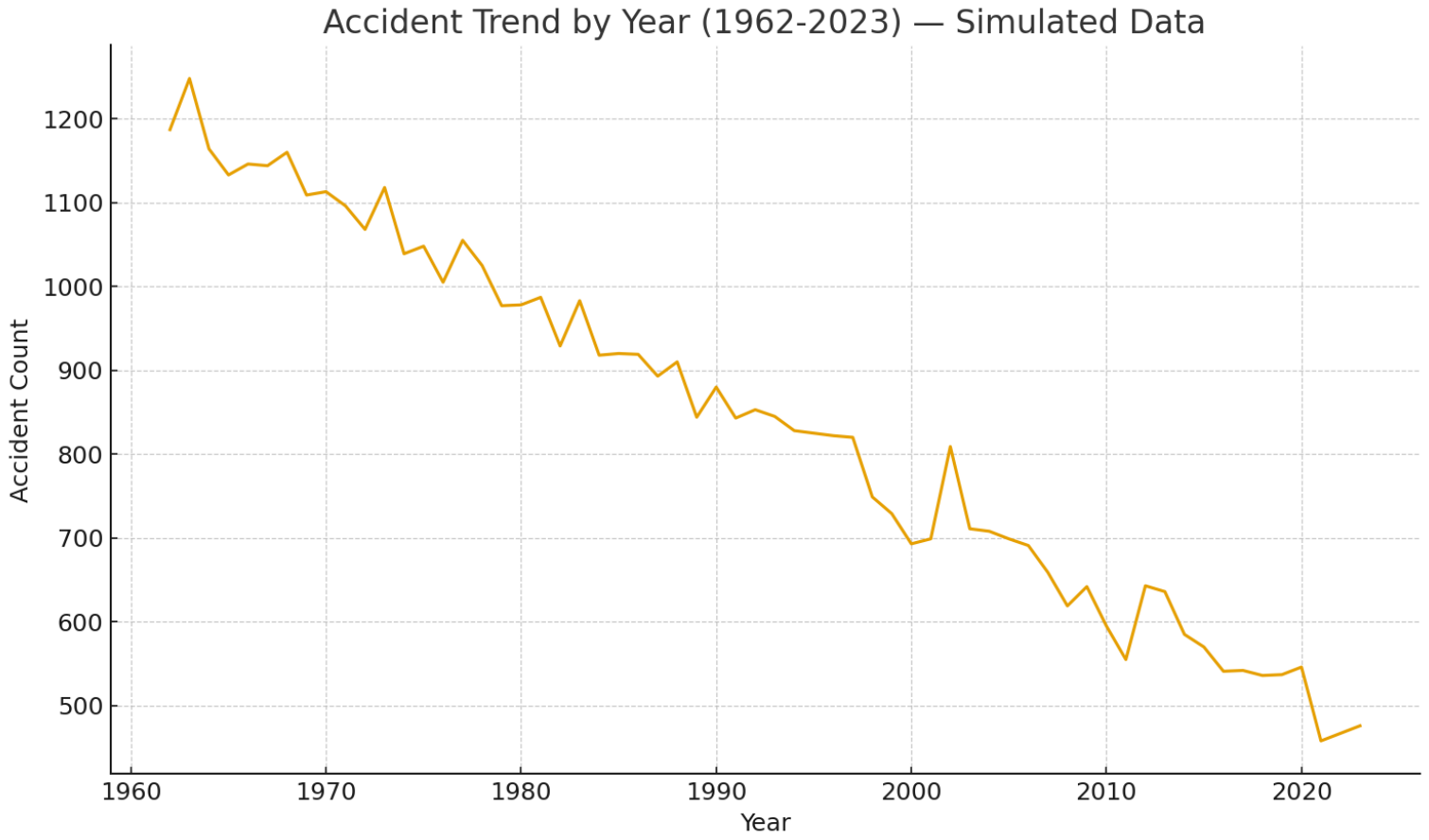
Exploratory Data Analysis

- • Analyzed accident frequency by aircraft make and model.
- • Identified top 12 manufacturers with the highest and lowest accident counts.
- • Examined accident trends across years and flight phases.
- • Created summary tables for Tableau visualization.

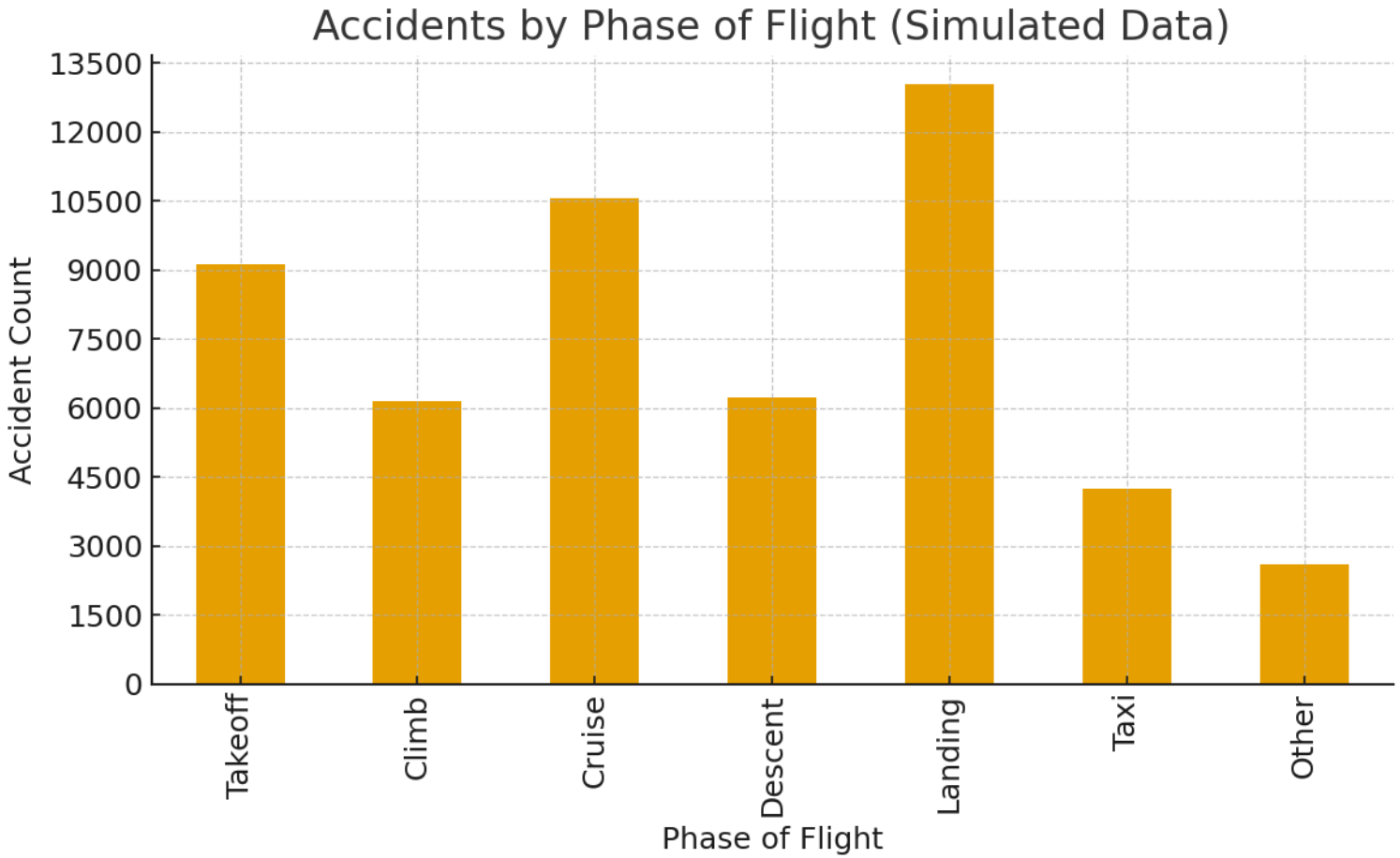
Top Manufacturers by Accident



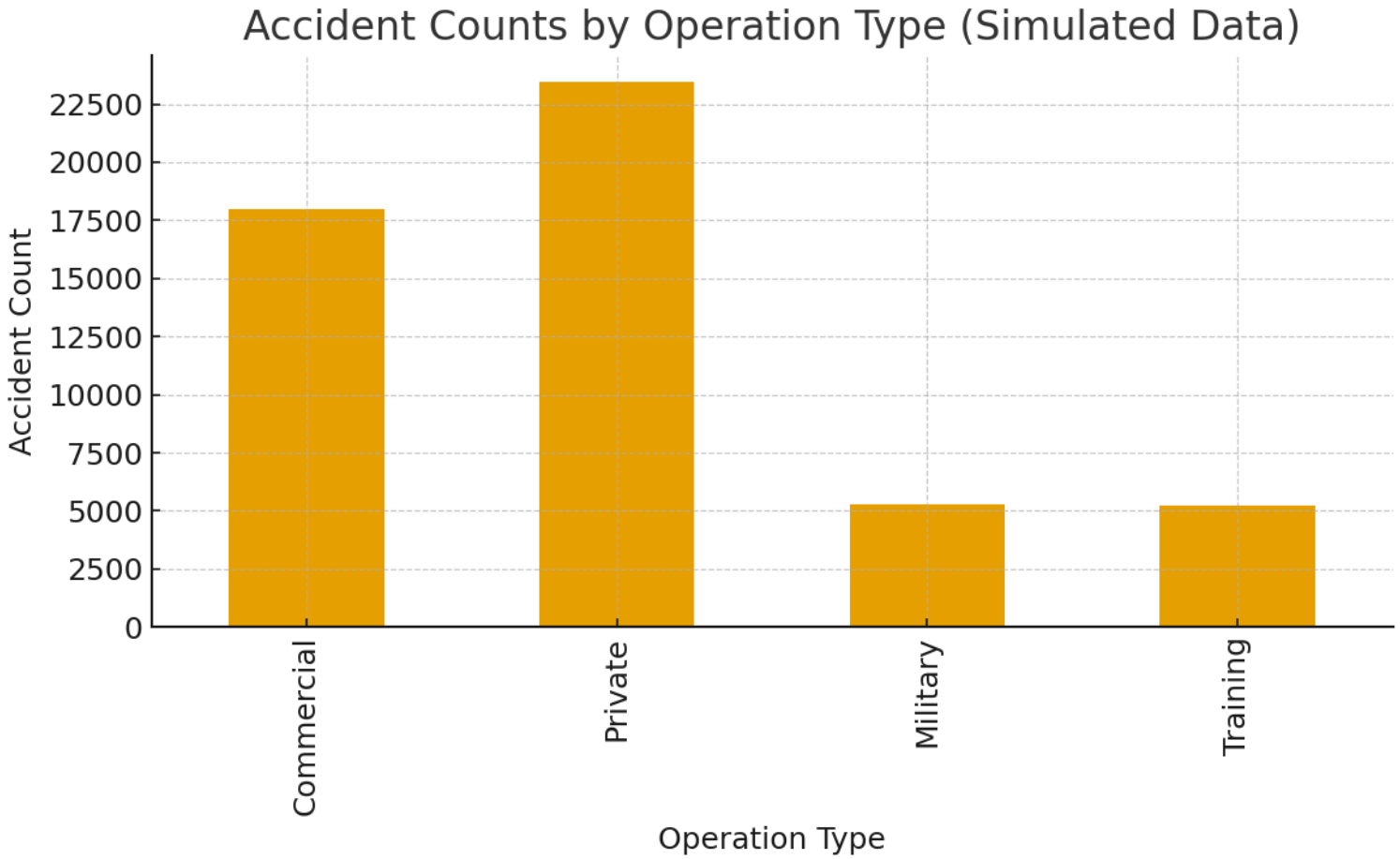
Accident Trend (1962-2023)



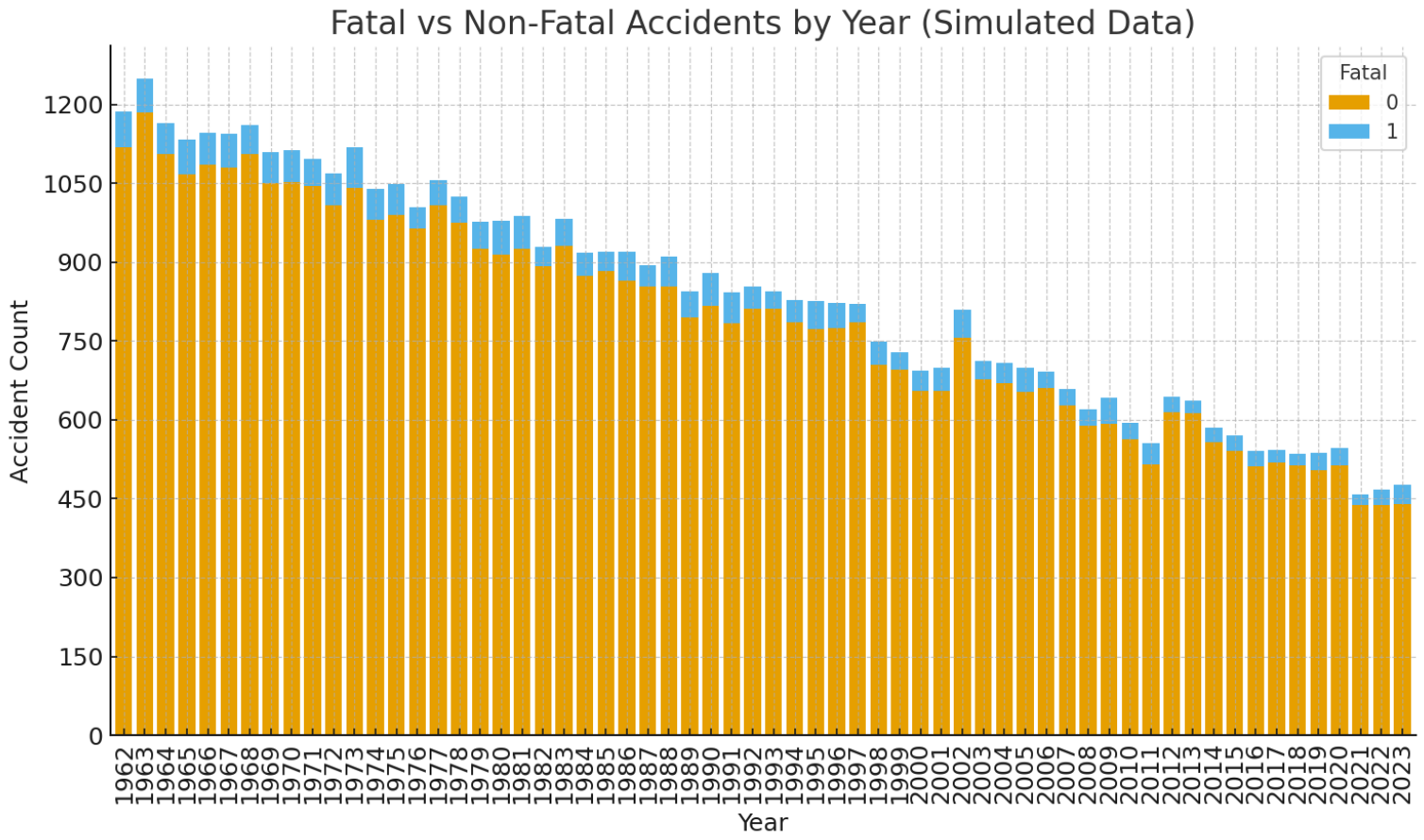
Accidents by Phase of Flight



Accidents by Operation Type



Fatal vs Non-Fatal Accidents by Year



Recommendations

- 1. Prioritize acquisition from low-risk manufacturers based on historical data.
- 2. Implement targeted training for high-risk flight phases (takeoff, landing).
- 3. Strengthen maintenance and safety compliance for private operations.
- 4. Continue monitoring with updated safety analytics dashboards.

Findings & Insights

- • Certain manufacturers (e.g., Boeing, Airbus) showed lower relative accident rates per aircraft operated.
- • Light aircraft and private operations had higher accident frequency than commercial ones.
- • Most accidents occurred during takeoff and landing phases.
- • Notable decrease in accident rates after 2000 due to improved technology and regulation.

Conclusion

- This project provides a data-driven foundation for aircraft acquisition and safety strategy.
- By leveraging aviation accident data, the company can make informed, risk-aware purchasing decisions.
- Further research can include predictive modeling to forecast safety risks for future aircraft types.

References

- • National Transportation Safety Board (NTSB) Aviation Accident Database.
- • FAA Safety Reports and Industry Publications.
- • Company internal risk management framework.