Aircraft Risk Analysis for Strategic Market Entry

Title & Background

Aircraft Risk Analysis for Strategic Market Entry

This project was developed to analyze aircraft accident data and identify the safest options for a company preparing to enter the aviation industry. Aviation is a promising but high-risk sector, where accidents can cause not only human loss but also financial and reputational damage. By applying data science methods in Jupyter Notebook and Tableau dashboards, we converted complex datasets into clear insights that support safe, data-driven investment decisions.

2. Business Problem

The key challenge faced by new entrants in the aviation industry is balancing growth opportunities with safety risks. A single severe accident can lead to reputational collapse, investor withdrawal, and legal penalties. Without a data-driven evaluation of accident history, decisions on which aircraft to invest in remain uncertain and risky. This project seeks to solve this problem by providing evidence-based insights into which aircraft have historically been safer, thereby reducing both operational and financial risks.

3. Project Overview

The project aimed to evaluate accident data in order to support evidence-based fleet decisions. The process included:

- Cleaning and standardizing datasets to handle missing values and inconsistencies.
- Aggregating data to reveal patterns in accident severity, geography, and aircraft type.
- Creating Tableau dashboards to communicate insights visually to non-technical stakeholders.
  The outcome is a set of actionable recommendations for executives considering aviation investment.

4. Stakeholders

The key stakeholders in this project include:

- **Business Executives:** who must decide which aircraft to acquire for market entry.
- **Risk Management Teams:** tasked with ensuring compliance and reducing safety risks.
- **Investors:** whose confidence depends on safe, strategic decision-making.
- **Regulators:** indirectly involved through enforcement of aviation safety standards.

5. Goals and Objectives

The overall goal was to provide business leaders with data-driven insights for reducing aviation risks and guiding safe investment decisions. The objectives were:

- Assess the distribution and severity of accidents across different aircraft models and manufacturers.
- Analyze how accident characteristics (fatalities, damage level, risk category) influence the likelihood of fatal incidents.
- Identify trends in accident frequency and severity over time and across geographical locations.

6. Data Understanding

The analysis used data from the **National Transportation Safety Board (NTSB)**, covering **civil aviation accidents and selected incidents** from **1962 to 2023**, including events in the **United States and international waters**.

Key features included:

- **Aircraft details:** model, manufacturer, and type.
- **Accident characteristics:** fatalities, injuries, damage level, and risk categories.
- **Contextual factors:** year, location, and country.

Data preprocessing involved:

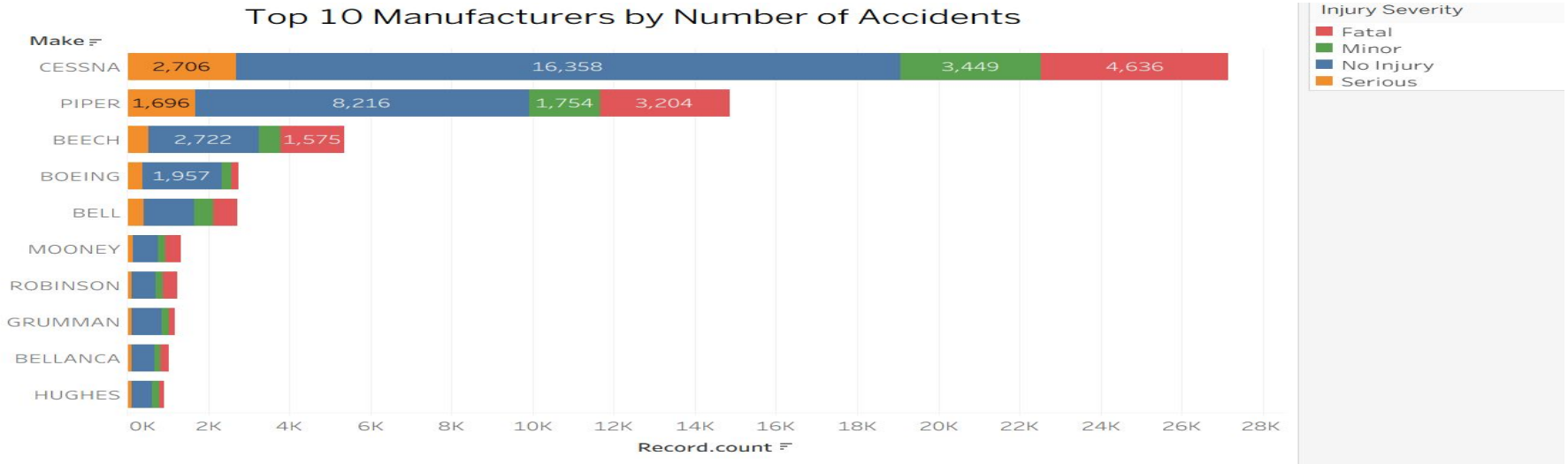
- Handling missing values to ensure accuracy.
- Aggregating accident records for meaningful comparisons.
- Structuring variables for effective visualization in the interactive dashboard.

7. Data Analysis

Objective 1: Assess the distribution and severity of accidents across aircraft models and manufacturers.

Findings:

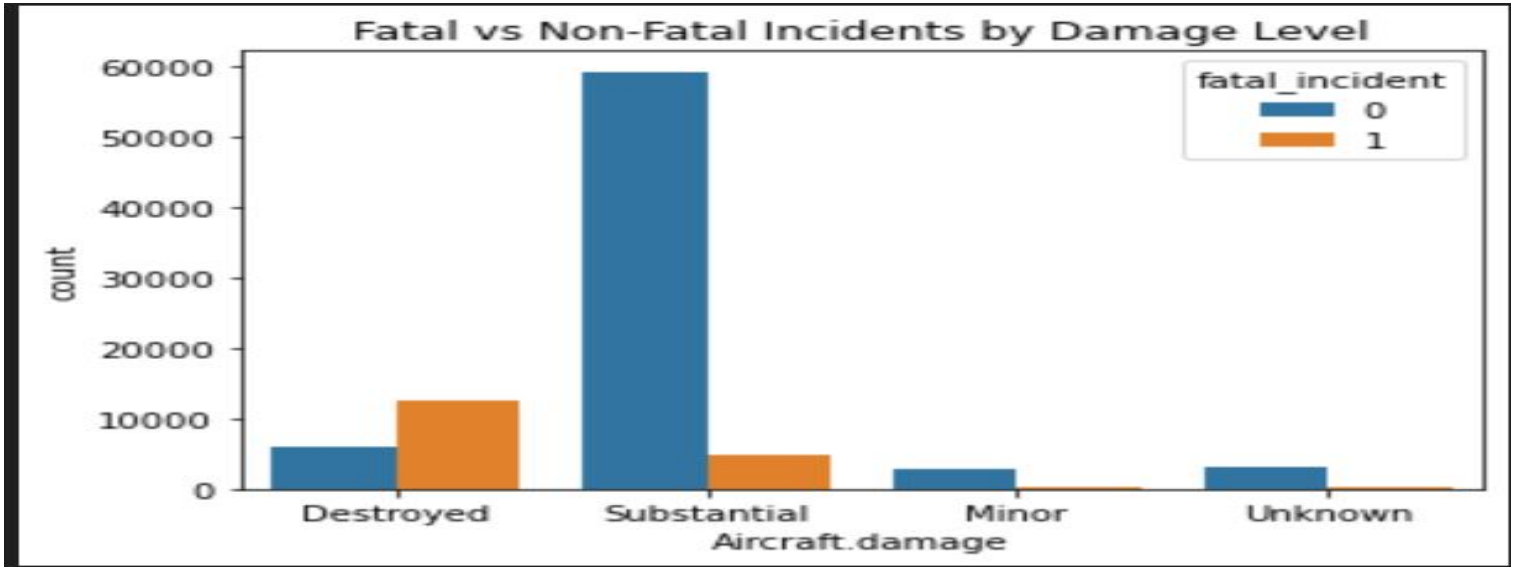
- Certain aircraft models consistently show higher accident frequencies and more severe outcomes.
- Others demonstrate stronger safety records, indicating more reliable options for investment



Objective 2: Analyze how accident characteristics influence the likelihood of fatal incidents.

Findings:

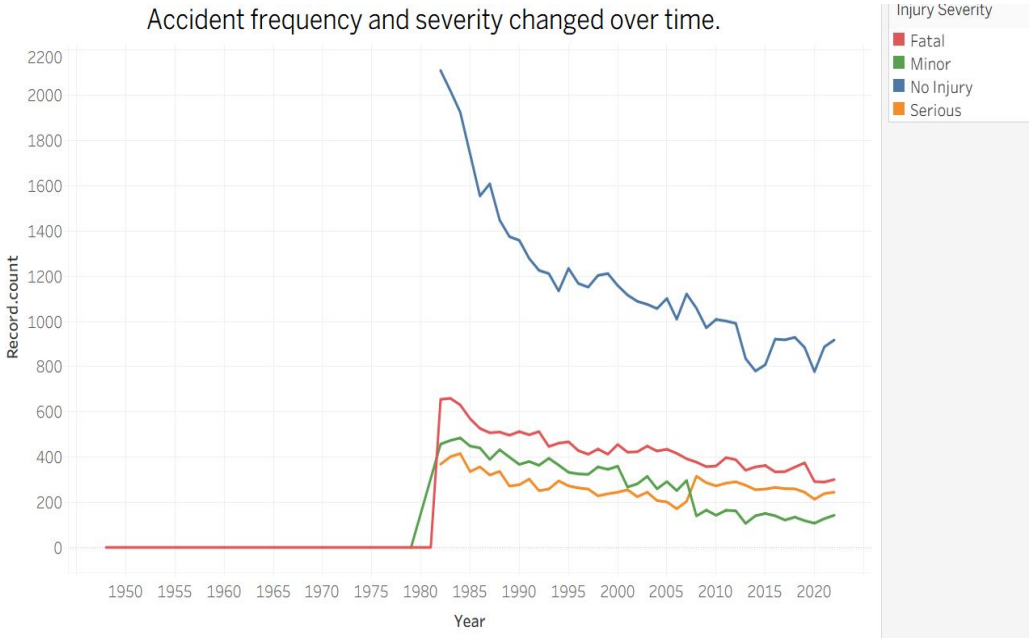
- High fatality counts are strongly linked with higher damage levels and risk categories.
- This relationship highlights that both aircraft design and operational factors contribute to safety outcomes.



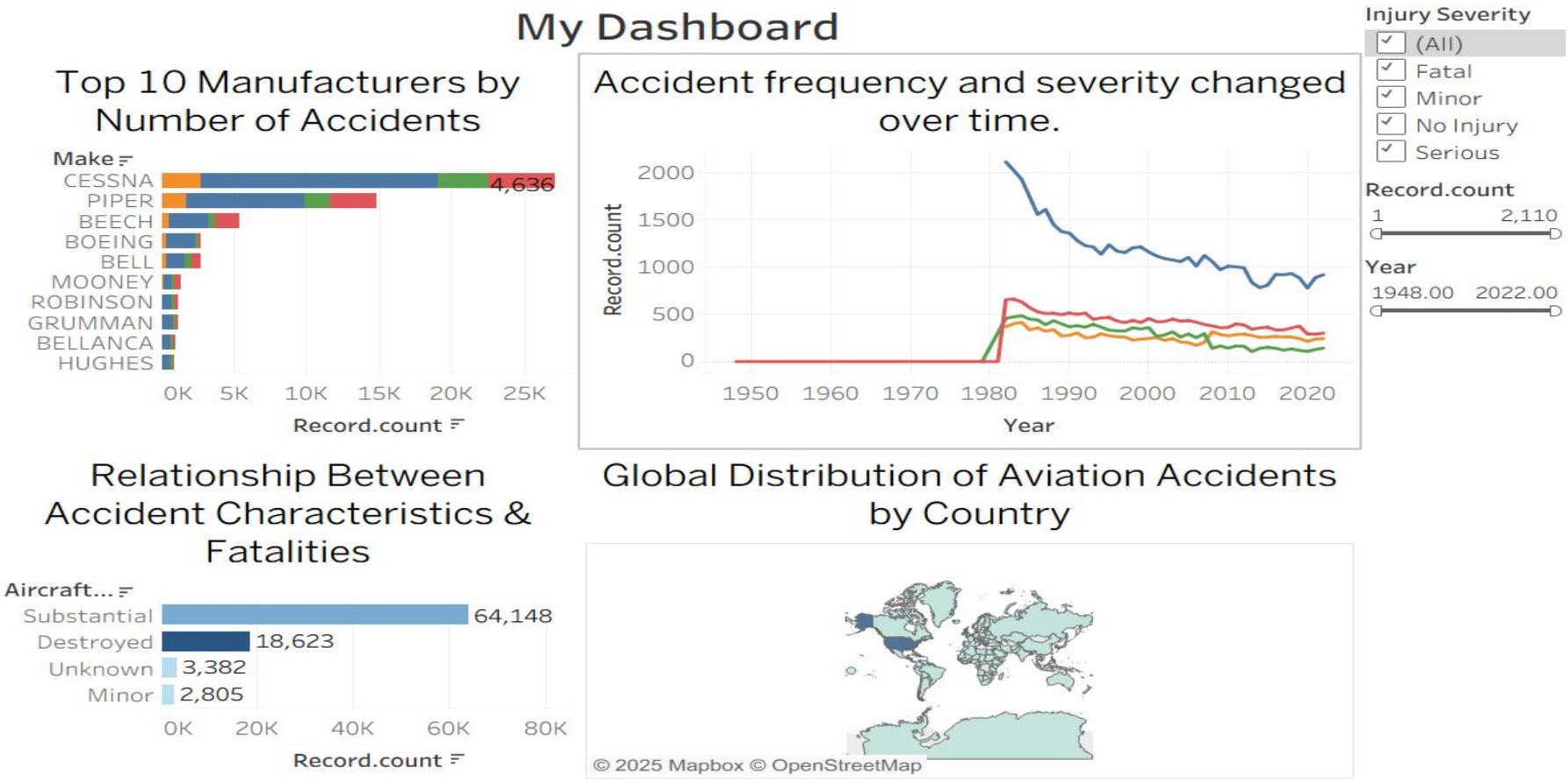
Objective 3: Identify trends in accident frequency and severity over time and across locations.

Findings:

- Accident rates have fluctuated over time, with noticeable improvements in recent years.
- Some countries and regions experience disproportionately higher accident risks.



My Tableau Dashboard



8. Conclusion

This project demonstrated how aviation accident data can be transformed into actionable insights for business decision-making. By analyzing accident distribution, severity, and trends, we identified key safety patterns across aircraft models, accident characteristics, and regions.

The findings highlighted that:

- Certain aircraft models have consistently stronger safety records.
- Accident severity is closely linked to fatalities and damage levels.
- Safety performance has improved over time, though risks remain concentrated in some regions.

Overall, the analysis provides a reliable, data-driven foundation to guide investment decisions and minimize aviation risks for new market entrants.

9. Recommendations

Based on the findings, three clear business recommendations emerge:

1. **Invest in Low-Risk Aircraft Models**
   Acquire aircraft with consistently lower accident severity rates, as these models provide safer and more reliable operations while strengthening customer and investor trust.

2. **Avoid High-Risk Models and Hazardous Regions**
   Exclude aircraft types with a history of frequent or fatal incidents and carefully evaluate high-accident regions. Entering safer markets first will reduce exposure to avoidable risks.

3. **Adopt Strong Safety Practices**
   Complement fleet selection with robust operational practices such as predictive maintenance systems, rigorous pilot training, and continuous monitoring of flight data. This ensures long-term safety and compliance with international standards.

10. Next Steps

Moving forward, the company should conduct a cost-risk analysis to connect safety outcomes with financial performance. Incorporating real-time maintenance and incident data will improve predictive risk management. Finally, presenting these findings to executives and engaging regulators will align the company’s strategy with global aviation standards.

11. Thank You

Thank you for your attention. I welcome your questions and look forward to discussing how these insights can support safe and profitable aviation market entry.

Contact Information:

Kumati Dapash
[www.linkedin.com/in/kumati-dapash-604174311]