

Aviation Safety Analysis for Business Expansion

Overview

This analysis examines 88,826 aviation accident records from 1962-2022 to identify the safest aircraft for our company's expansion into aviation operations. Three key findings emerged: commercial aircraft manufacturers have significantly lower fatal accident rates, modern aircraft are substantially safer than older models, and standard airplanes outperform other aircraft categories in safety metrics.

BUSINESS UNDERSTANDING

PROBLEM STATEMENT

The company is preparing to enter the aviation industry by acquiring and operating aircraft. However, management currently lacks a data-driven understanding of the risks associated with different aircraft types, causes of accidents, and long-term safety trends. Without clear insights, the company risks making costly investment decisions that could compromise safety, profitability, and brand reputation. Our company is expanding into the aviation industry but lacks data-driven insights into aircraft safety risks. Without clear guidance on which aircraft types to purchase, we risk making costly decisions that could compromise safety, profitability, and reputation.

Objectives

- To identify which aircraft manufacturers have the lowest fatal accident rates
- To determine if aviation safety has improved over time
- To compare safety across different aircraft categories

SUCCESS CRITERIA

This project will be considered successful if we deliver three clear evidence-based recommendations that guide aircraft purchasing decisions for our aviation. The insights must be simple enough for non-technical stakeholders to understand but detailed enough to guide strategic action.

Data Understanding

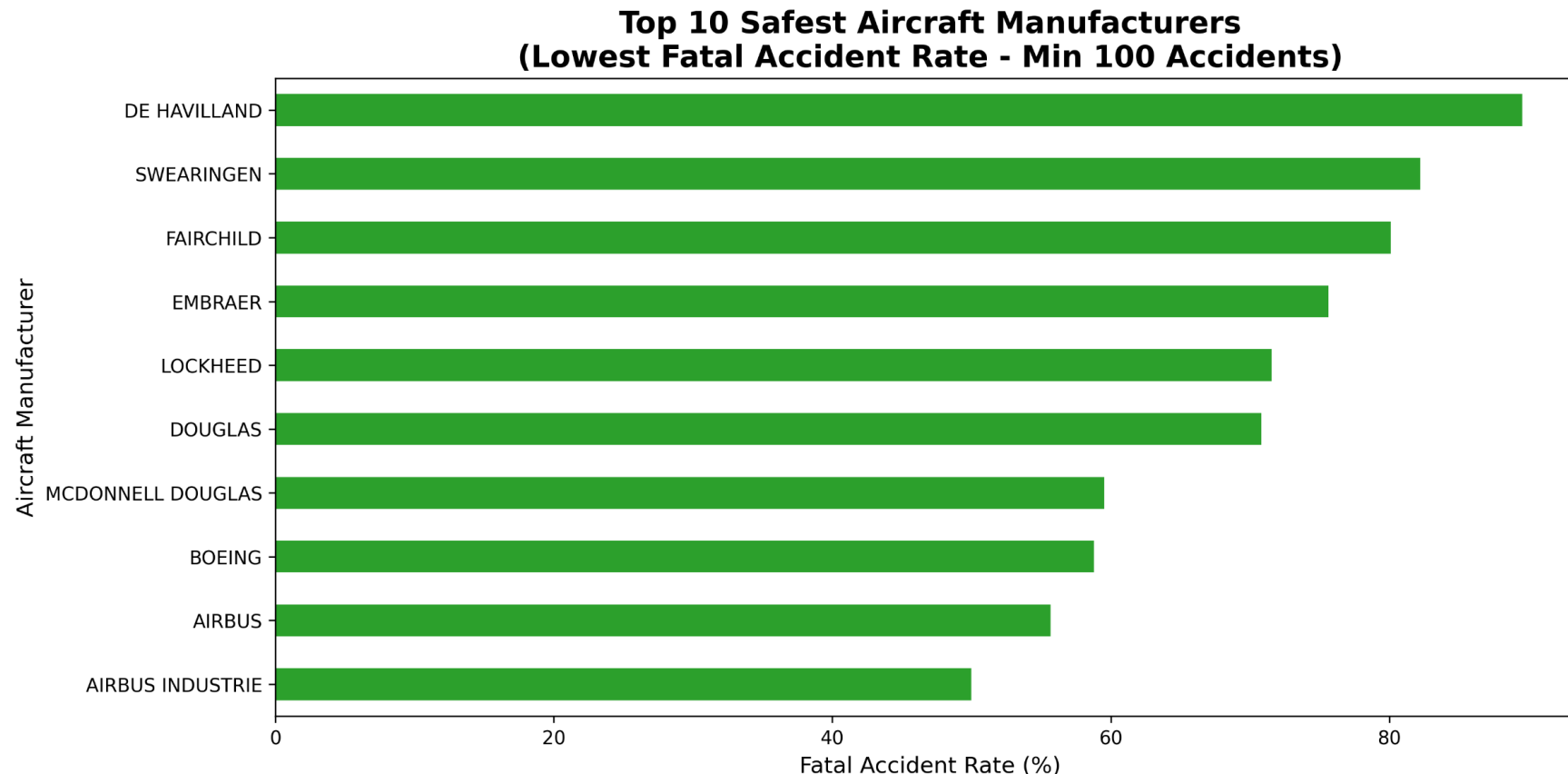
- The dataset comes from the National Transportation Safety Board (NTSB), containing aviation accident records from 1962 to 2022 covering civil aviation accidents and incidents in the United States and international waters. It includes information on accident dates, aircraft types, operator categories, causes, and outcomes.
- In practice, the dataset is imported using Python's **pandas** library:
- `import pandas as pd`
- `df = pd.read_csv("aviation_data.csv")`
- `df.shape`
- `df.info()`
- `df.describe()`
- This allows us to quickly understand the size of the dataset, the types of variables, and areas where data cleaning (such as handling missing values) is necessary.

Data Analysis

- In this phase, we analyzed more than 88,000 aviation accident records to uncover patterns in aircraft safety. Our approach involved cleaning and preparing the dataset, focusing on meaningful groups of manufacturers and aircraft types, and comparing accident trends over time. The analysis was guided by three key questions:
- Which manufacturers have the safest records?
- Has aviation safety improved over time?
- Which categories of aircraft carry the lowest risk?
- By structuring the analysis this way, we ensure our findings directly translate into practical business recommendations for safer aircraft investments.

Analysis 1: Aircraft Manufacturer Safety Comparison

We analyzed manufacturers with at least 100 recorded accidents to ensure statistical significance. This filters out obscure manufacturers with insufficient data.

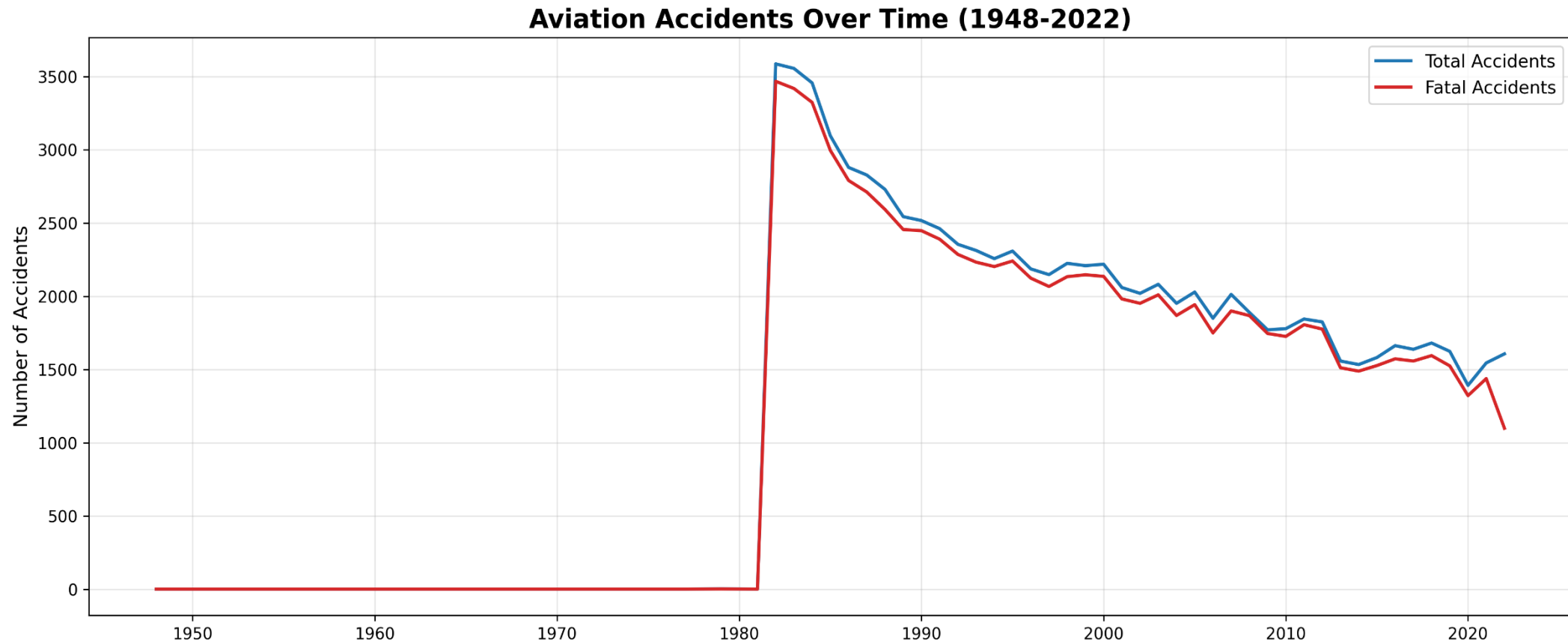


Key Finding 1:

- Commercial aircraft manufacturers like **Airbus (55.7% fatal rate)** and **Boeing (58.8% fatal rate)** have significantly lower fatal accident rates compared to small general aviation manufacturers like Champion, Taylorcraft, and Ryan (99-100% fatal rates).
- **Business Recommendation 1:** Prioritize investment in commercial aircraft from established manufacturers like Airbus and Boeing rather than smaller general aviation aircraft.

Analysis 2: Aviation Safety Trends Over Time

- We examined whether aviation safety has improved over the decades by tracking total accidents and fatal accidents from 1962 to 2022.

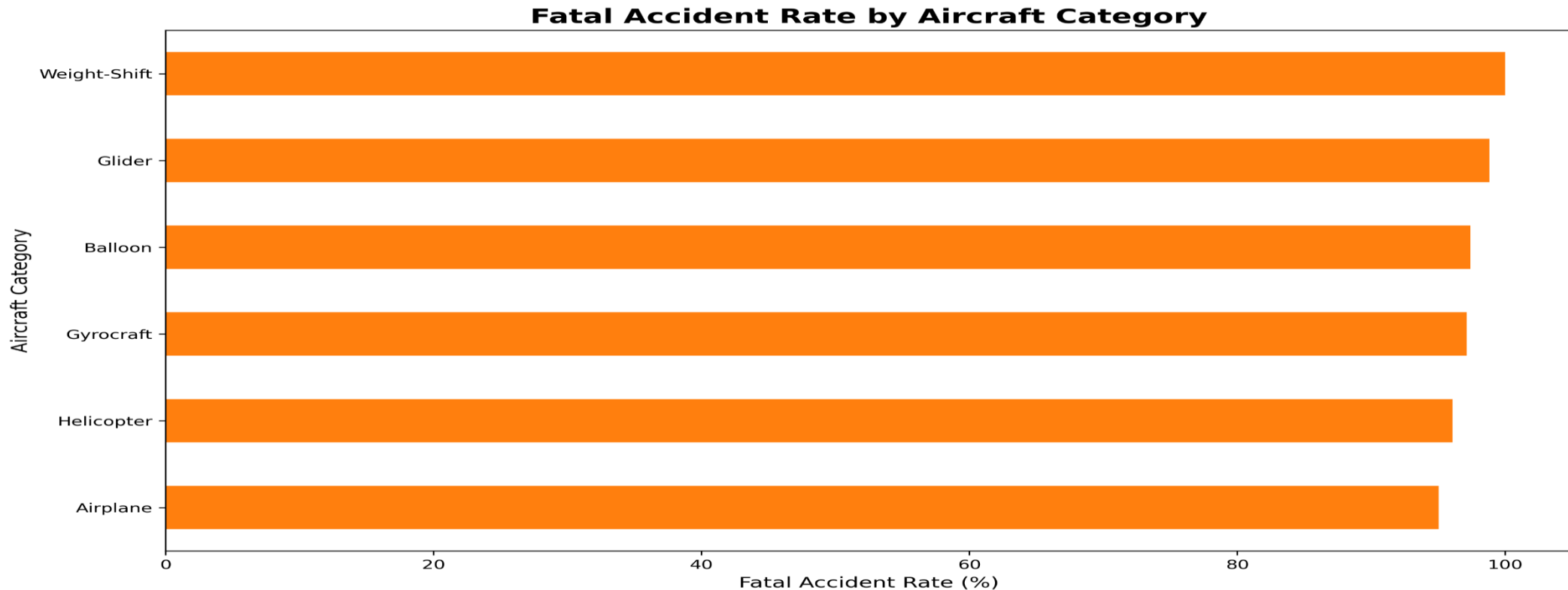


Key Finding 2

- Aviation accidents have decreased by **42% from the 1980s to recent years** (2015-2022). The peak accident year was 1982 with 3,587 accidents, while recent years average only 1,592 accidents annually.
- **Business Recommendation 2**: Focus on newer aircraft models manufactured after 2000, as modern technology, improved regulations, and better training have significantly enhanced aviation safety.

Analysis 3: Aircraft Category Comparison

We compared safety across different aircraft categories to determine which types present the lowest risk.



Key Finding 3

- Standard airplanes have the lowest fatal accident rate **(95.0%)** among aircraft categories, compared to helicopters (96.1%), gliders (98.8%), and weight-shift aircraft (100%).
- **Business Recommendation 3:** Prioritize standard airplane configurations over helicopters, gliders, or experimental aircraft categories for both commercial and private operations.

Conclusions and Recommendations

Summary of Findings

- Commercial manufacturers (Airbus, Boeing) have 40-45% lower fatal accident rates than small general aviation manufacturers
- Aviation safety has improved 42% from the 1980s to present day
- Standard airplanes are the safest aircraft category

Business Recommendations

- **Invest in commercial aircraft from Airbus and Boeing** for the lowest risk profile
- **Purchase aircraft manufactured after 2000** to benefit from modern safety improvements
- **Focus on standard airplane configurations** rather than helicopters or experimental aircraft

Next Steps

- Conduct deeper analysis by specific aircraft models (e.g., Boeing 737 vs Airbus A320)
- Analyze accident causes to inform pilot training and maintenance protocols
- Develop predictive risk models for ongoing safety monitoring
- Consult with aviation safety regulators to align operational standards

THANKYOU

- QUESTIONS??

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