Aviation Accident Analysis

BY MICHELLE MWENDE

Project Overview

This project analyzes aviation accident data to identify the lowest-risk aircraft for a company expanding into the aviation industry. Using data cleaning, analysis, and visualization, the study highlights accident trends, aircraft risk profiles, and key contributing factors. The goal is to provide actionable insights that guide investment decisions on which aircraft models are safest and most cost-effective for commercial and private operations.

Problem Statement

- The company plans to expand into aviation but lacks knowledge of aircraft risks. Without a data-driven analysis of accident patterns and safety outcomes, it risks investing in high-risk aircraft, leading to higher costs, liabilities, and safety concerns.

Business objectives

- To assess the relationship between accident severity and aircraft characteristics
- To determine the impact of flight purpose on accident outcomes
- To analyze the effect of weather conditions on accident severity
- To examine accident patterns across different phases of flight
- To rank aircraft makes and models based on safety outcomes

Data

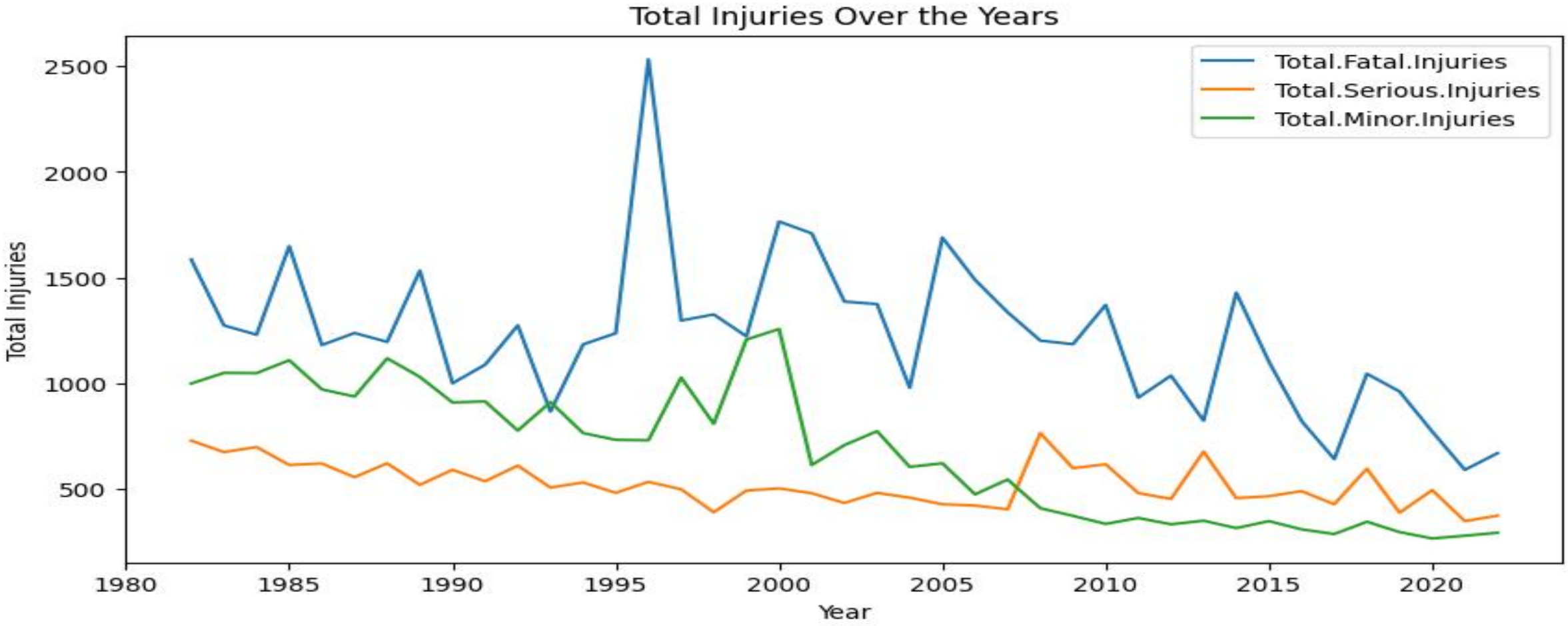
- The analysis is based on the Aviation Accident dataset sourced from this https://github.com/learn-co-curriculum/dsc-project-template.git
- . The dataset contains over 90,000 records spanning from 1948 to 2020, though this study focuses on data from 1982 onwards for consistency and reliability.
- It includes 31 variables in total, with the analysis emphasizing key factors such as injury severity, aircraft damage, make and model, and engine type, as these are most relevant to assessing accident risks and guiding investment decisions.

Methods

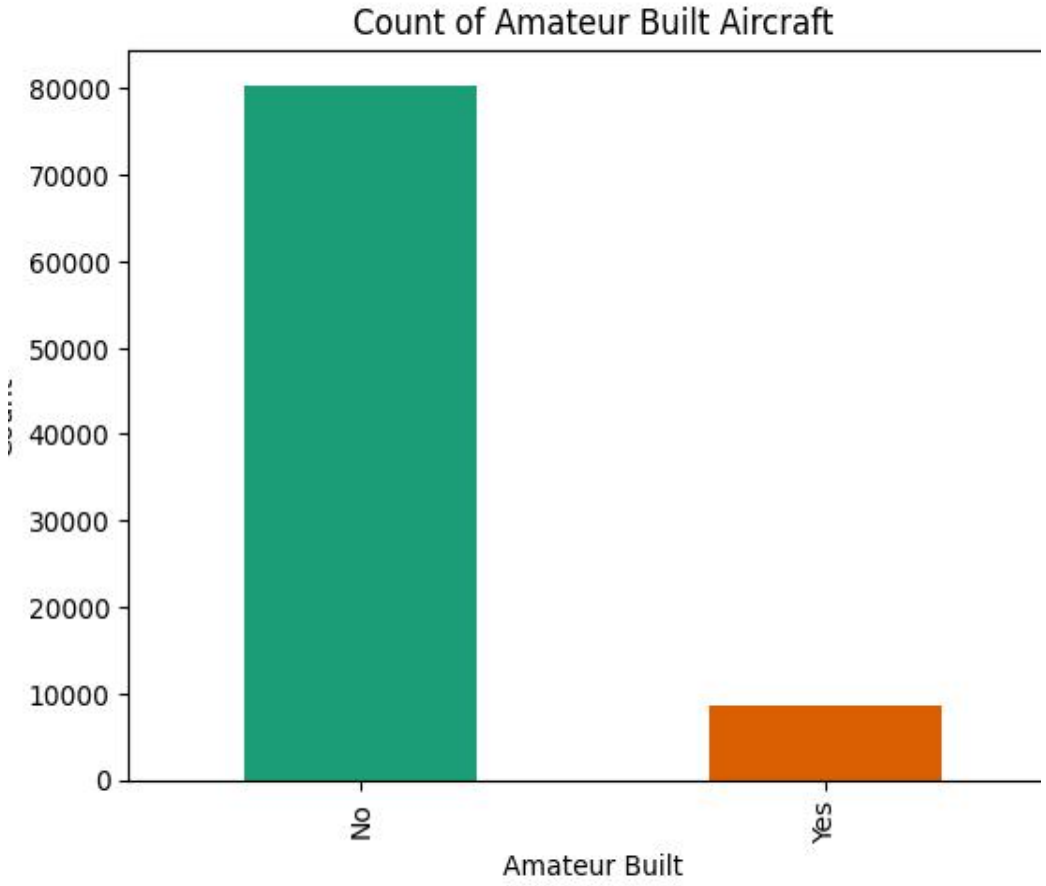
- This project uses descriptive analysis with grouping, aggregation, and visualization to identify accident patterns by aircraft type, injury severity, flight purpose, and weather. Bar charts and line plots highlight key insights, supporting data-driven recommendations for safer aircraft investment.

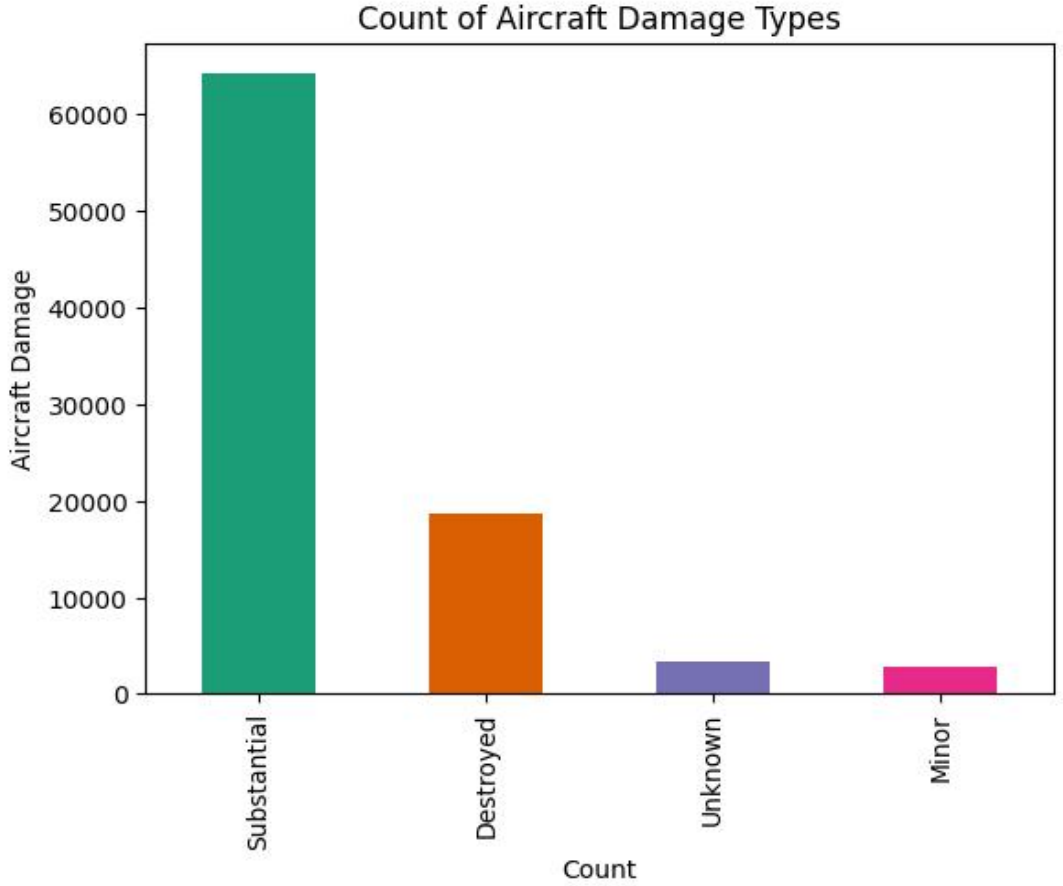
RESULTS

The graph suggests significant progress in aviation safety over the past 40 years. The decrease in all injury types, especially fatalities, points toward better aircraft technology, stricter regulations, and improved emergency response.

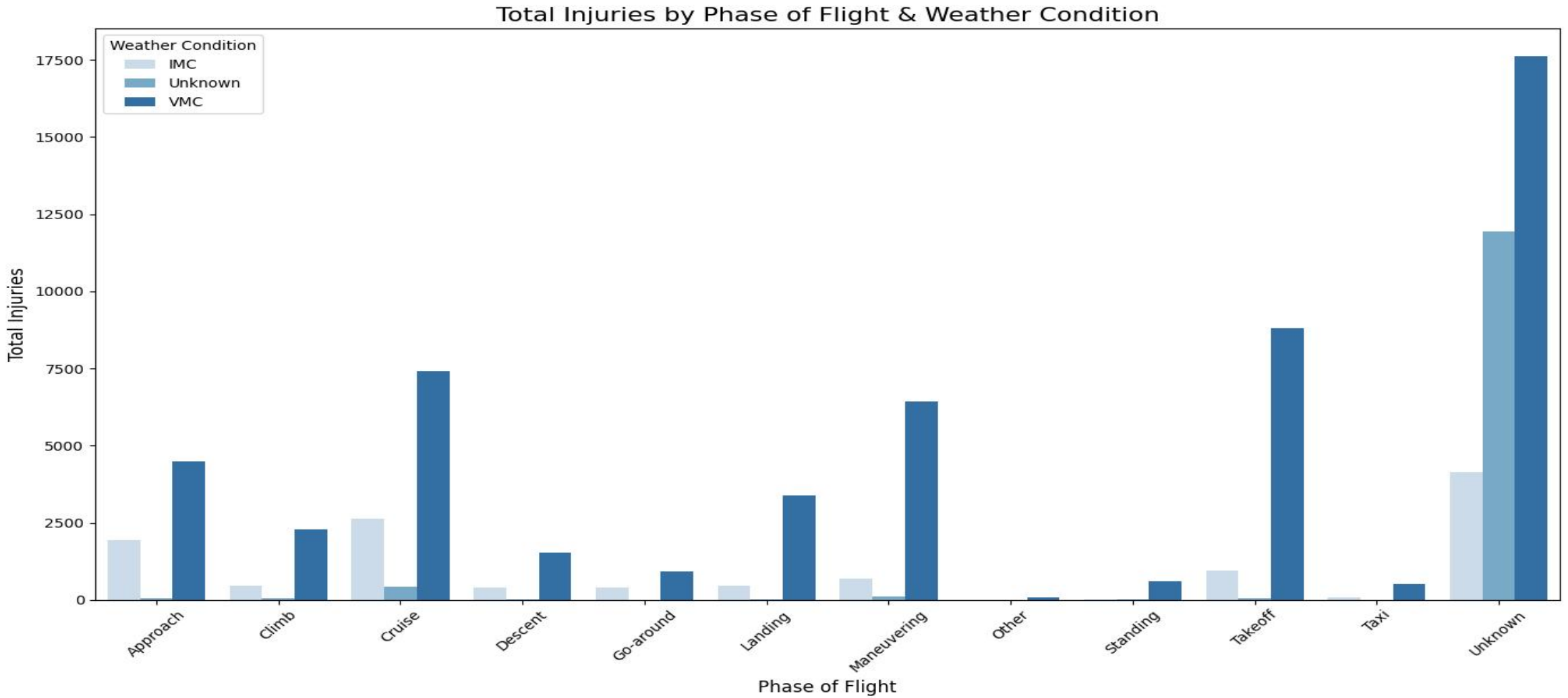


The majority of accidents involved factory-built (non-amateur) aircraft, reflecting their higher prevalence in aviation compared to amateur-built planes.
A large portion of accidents result in Substantial or Destroyed aircraft damage. Minor damage cases are much less frequent. This suggests that when accidents occur, they are often costly in terms of aircraft loss.

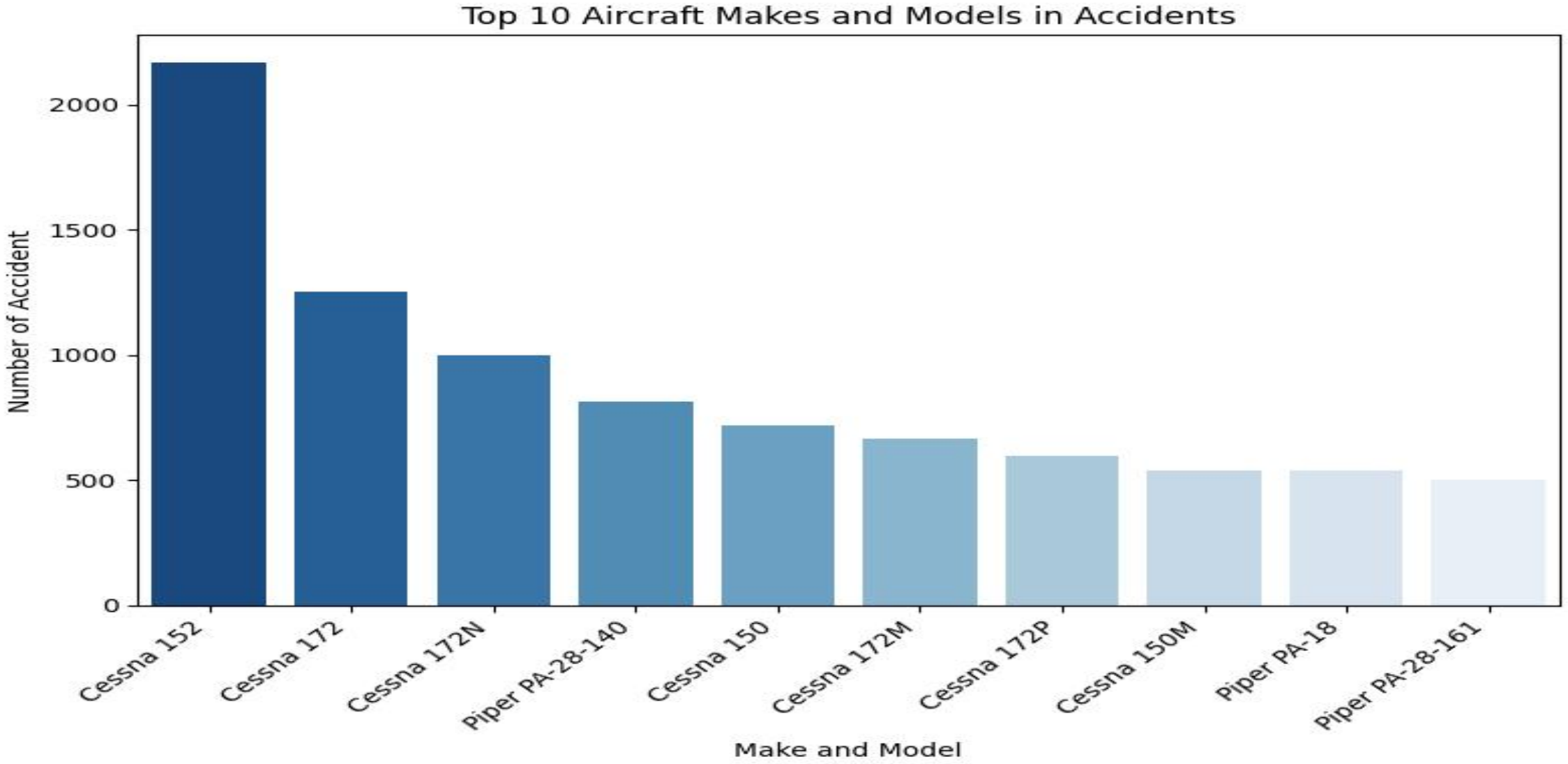




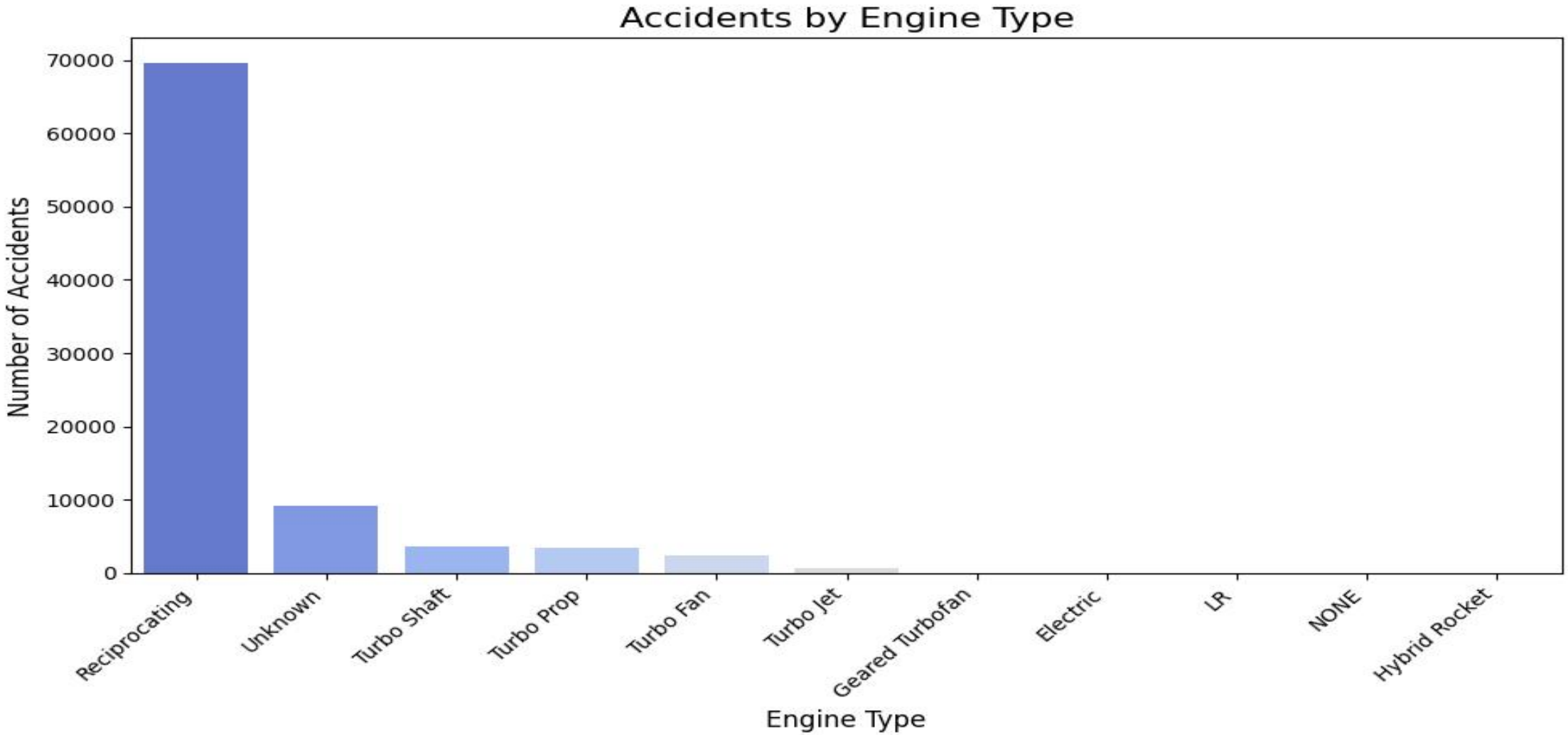
Most accidents occur under favorable weather (VMC) → likely due to higher flight frequency..
High accident rates during take-off and cruise phases.



Cessna152, Cessna172, Cessna172N invoved in more accidents. This might be due to the popularіy of these models but more investigation must be conducted.



Accident counts vary by engine type, reflecting usage rates.



Conclusion

- The analysis of aviation accident data shows that overall safety in the industry has steadily improved since the early 1980s, reflecting advancements in aircraft technology, regulatory frameworks, and pilot training programs.
- A closer look at accident distribution reveals that factory-built, certified aircraft dominate accident records, largely because they make up the majority of aircraft in operation
- . Accidents in clear weather further suggest that human error, rather than environmental conditions, is often the root cause.
- Certain models, such as the Cessna 152 and Cessna 172 series, appear frequently in accident data, but this is likely influenced by their widespread use in training and recreational aviation rather than inherent design flaws.

Recommendations

- Based on these insights, the company is recommended to invest in certified, factory-built aircraft with proven safety records, supported by comprehensive insurance and rigorous maintenance schedules to mitigate the financial impact of accidents. Strong pilot training and error-reduction programs should be emphasized, particularly targeting critical flight phases where risk is greatest. Seasonal and weekend risk patterns also call for heightened operational vigilance during these periods. By adopting these measures, the company can minimize risks while establishing a safe and competitive presence in the aviation industry.

Thanks!

THANKS FOR YOUR ATENTION