AVIATION RISK ANALYSIS

GENERAL OVERVIEW

Aviation is one of the safest modes of transport, yet accidents—though rare—carry significant human, financial, and reputational consequences.

This project analyzes historical aviation accident data to:

- Uncover patterns and trends over time
- Identify the safest aircraft models
- Highlight key factors influencing accident severity

OUTLINE

- Business understanding
- Data understanding
- Data Analysis
- Conclusions
- Recommendation
- Next Steps

BUSINESS UNDERSTANDING

Problem Statement

- Aviation accidents, although infrequent, have high human, financial, and reputational costs.
- Each incident can lead to loss of life, regulatory penalties, insurance claims, and damaged public trust.
- Airlines must make strategic safety investments in fleet, training, and technology, but decisions are often made without fully leveraging data.

Objectives

- ✓ Identify the safest aircraft models

Compare accidents severity across different aircrafts typed to guide fleet acquisition and leasing decisions

- ✓ Analyze accident trends over time

Understand how accidents frequency and severity have changed , and what this means for long-term safety strategies

- ✓ Examine key risk factors (human, technical, environmental)

Asses the role of human error, mechanical failure, and environmental conditions in accident severity

- ✓ Provide actionable business recommendations

Translate findings into actionable steps that reduce risk, strengthen safety practices, and support compliance

DATA UNDERSTANDING

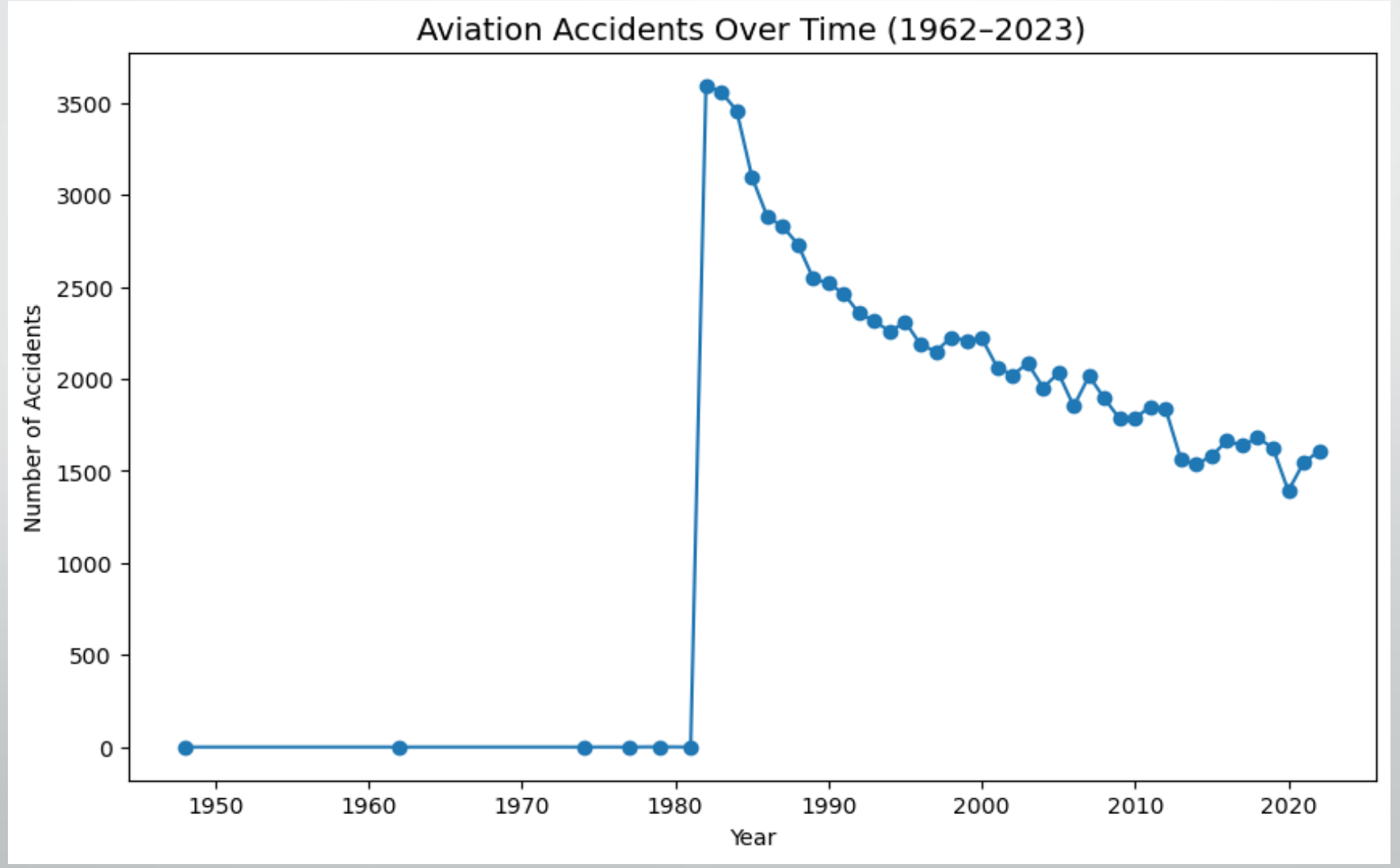
- The aviation accident dataset used in this analysis comes from the National Transportation Safety Board that includes aviation accident data from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters.
- It contains detailed information such as aircraft model, manufacturer, and category, accident date and location, and severity level. The dataset also includes contributing factors like human error, technical or mechanical failures, and environmental conditions, along with outcomes such as injuries, fatalities, and property damage.

DATA ANALYSIS

- The goal of this analysis is to uncover patterns and insights from aviation accident data that can help identify lower-risk aircraft for investment. By examining trends over time, differences across aircraft types, accident severity, and contributing factors, we can provide evidence-based recommendations to support strategic decision-making.

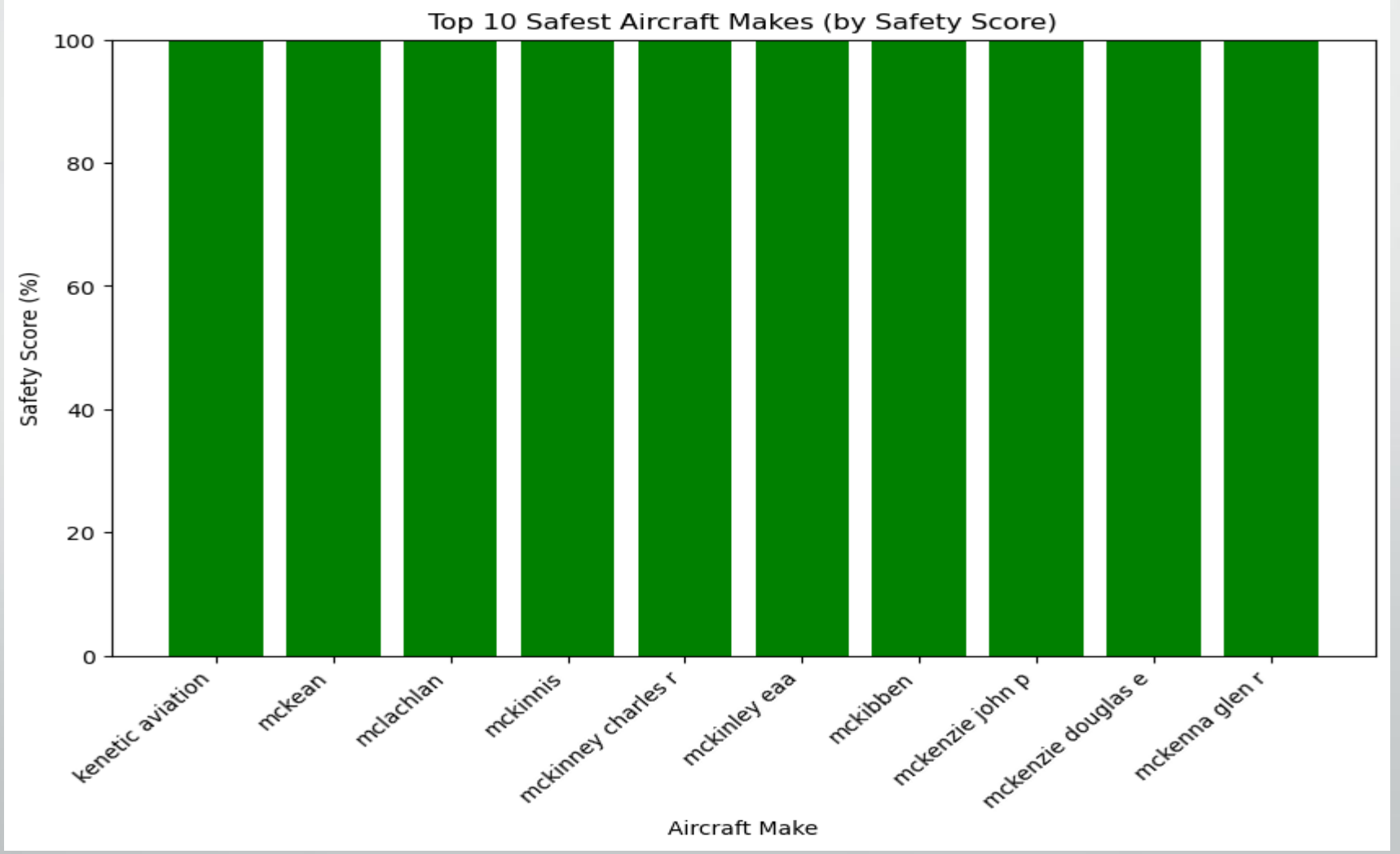
- The following sections highlight key findings using descriptive statistics and visualizations that make the results easier to interpret for you business stakeholders.

1.ACCIDENTS PER YEAR



- The sharp spike seen around 1982 does not represent an actual surge in accidents but is likely due to a change in reporting or data collection methods. What is more important is the clear downward trend from the mid-1980s to the present, showing continuous improvements in aviation safety.
- Advances in aircraft technology, stricter regulations, and better training have all contributed to reducing accidents, even as global air traffic has increased. Overall, the long-term trend demonstrates that aviation is becoming progressively safer

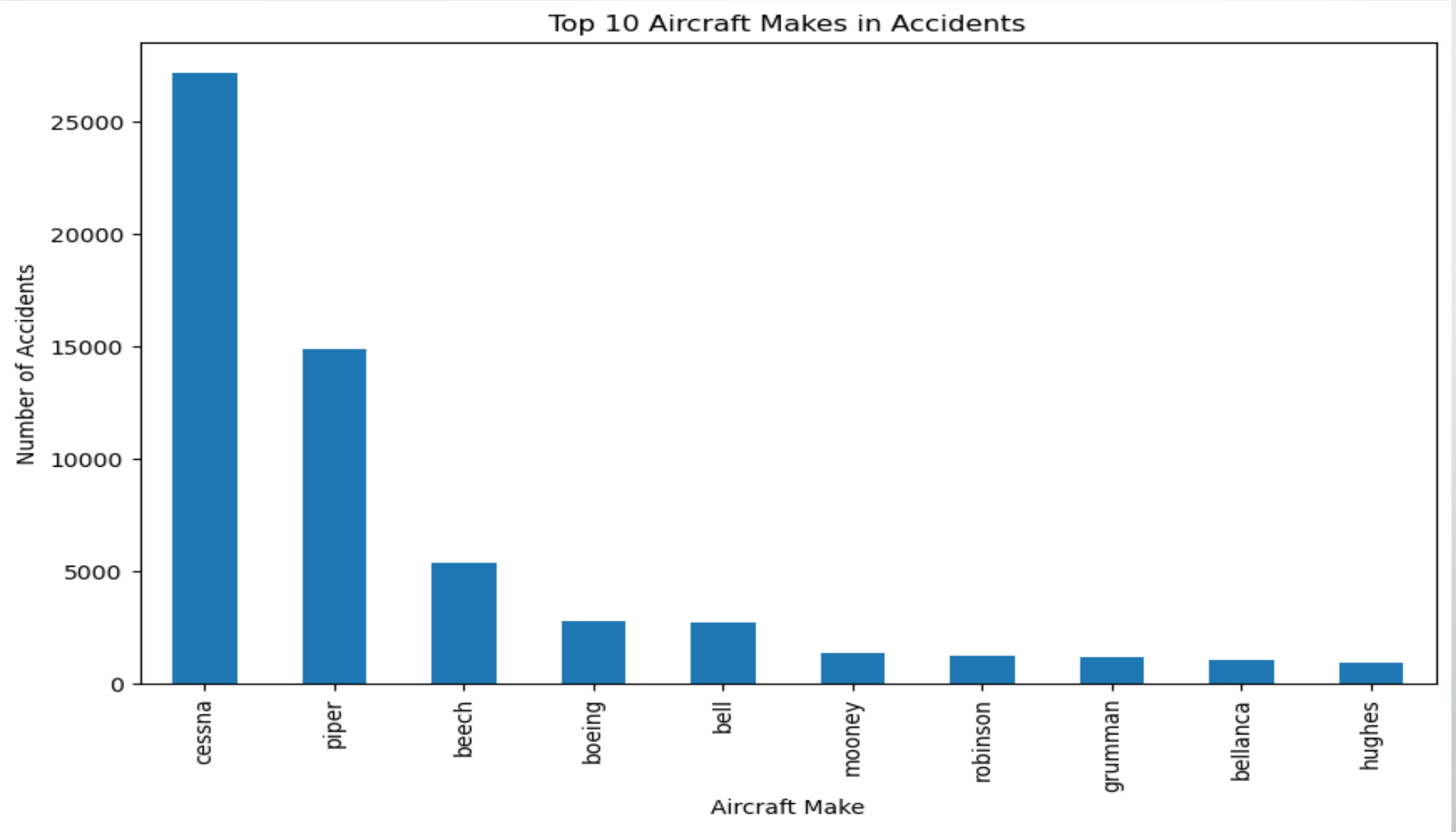
2.Top 10 Safest Aircraft Makes (by Safety Score)



Severity_Clean	non-fatal	fatal	Total	Safety_Score
Make				
kenetic aviation	1	0	1	100.0
mckean	1	0	1	100.0
mclachlan	1	0	1	100.0
mckinnis	1	0	1	100.0
mckinney charles r	1	0	1	100.0
mckinley eaa	1	0	1	100.0
mckibben	1	0	1	100.0
mckenzie john p	1	0	1	100.0
mckenzie douglas e	1	0	1	100.0
mckenna glen r	1	0	1	100.0

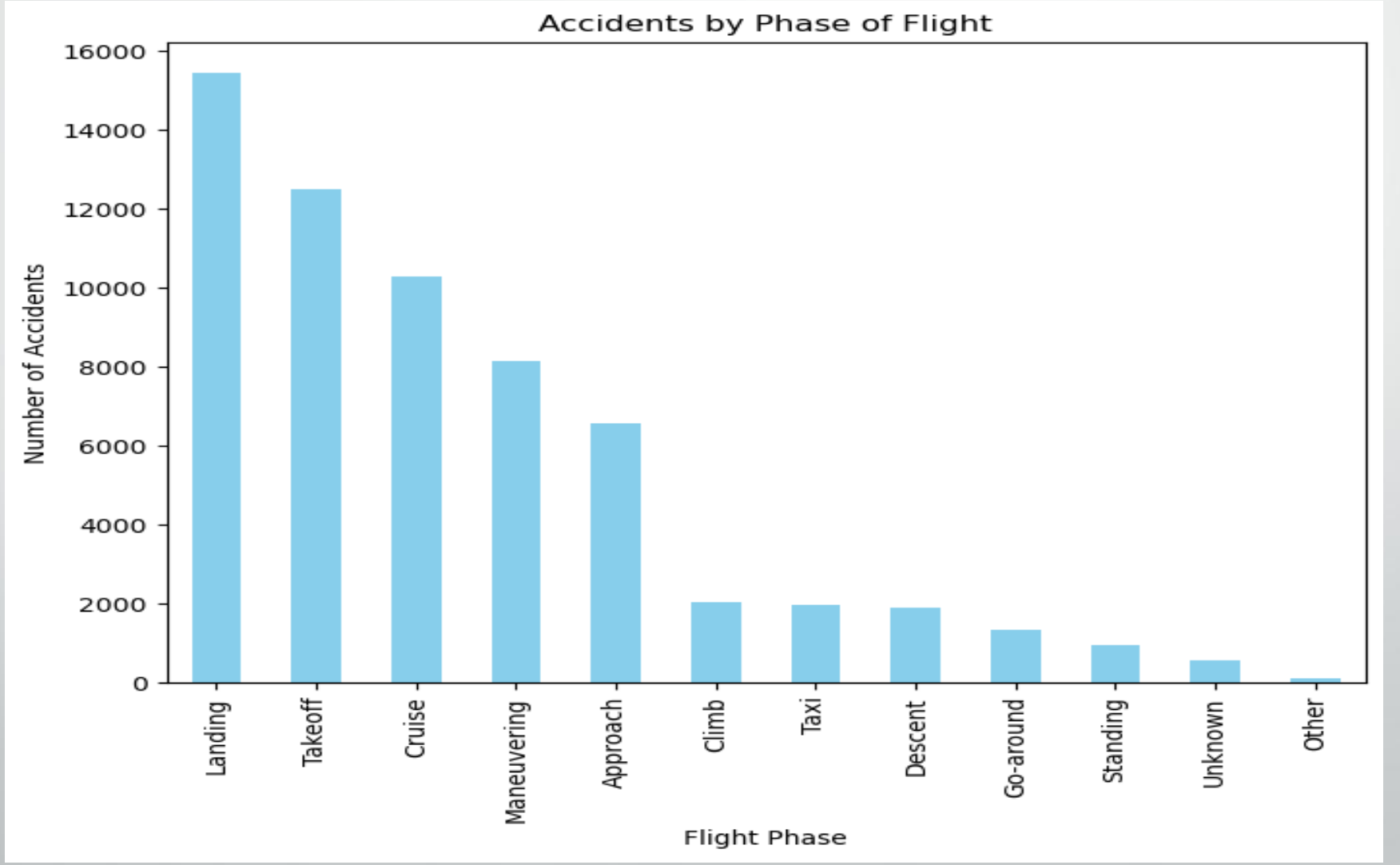
- The graph shows that Kenetic Aviation, McKean, McLachlan, McKinnis, McKinney, McKibben, and McKenzie have the fewest accidents over the years, making them the safest options to consider.

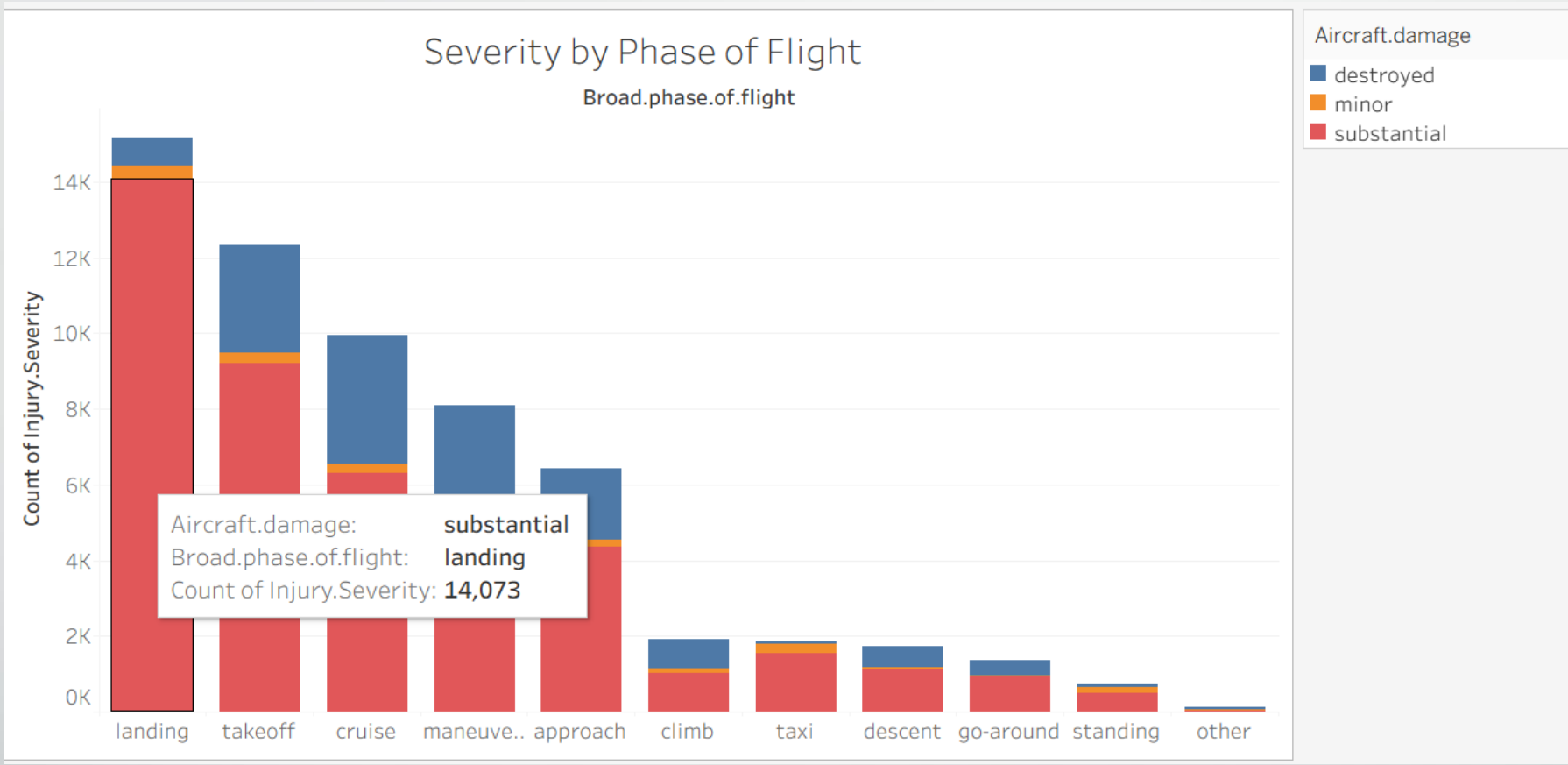
3.Top 10 Aircraft Makes in Accidents



- The graph highlights the 10 aircraft makes with the highest accident rates. Notably, Cessna and Piper appear more frequently in accidents over the years.
- I would recommend to exercise careful consideration when selecting these makes, as they may carry a higher level of risk

4.Accidents by Phase of Flight

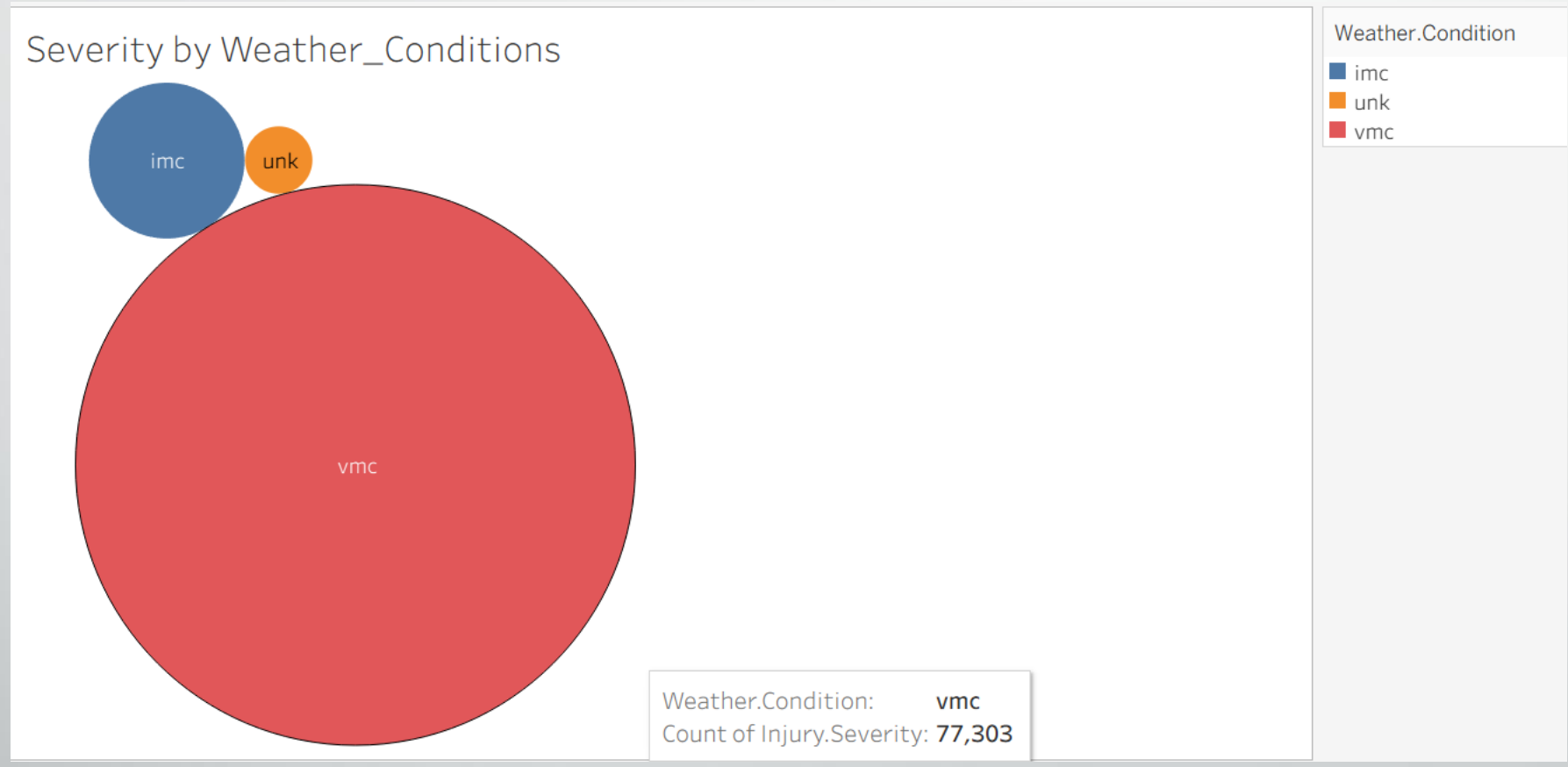




From the graph above, it is clear that most of the damages are substantial, indicating serious impairment to aircraft functionality. This emphasizes the importance of employing highly trained professionals, particularly during landing, which is a critical phase responsible for many accidents. Careful selection and training of pilots are therefore essential to improve overall aviation safety

- Landing is a critical phase of flight, and pilots must exercise extra care.
- The graphs show that many accidents over the years have occurred due to incorrect or unsafe landings, highlighting the importance of proper technique and attention during this phase.

5.*Severity by Weather Conditions*



Weather Conditions Analysis

- IMC: Poor visibility requiring instrument reliance
- VCM: Mist near airports, especially risky during landing
- UNK: Unknown or missing weather reports

For our operations, VCM is the key concern, as reduced visibility during approach and landing increases accident risk.

Therefore :

1. Invest early in modern runway lighting and navigation systems
2. Prioritize pilot training on low-visibility landings
3. Adopt real-time weather monitoring and alert tools
4. Develop clear diversion protocols to alternate airports

CONCLUSIONS

- Analysis of accident data over the years indicates that certain aircraft makes, such as Cessna and Piper, consistently show higher accident rates, suggesting increased operational risk.
- Other manufacturers, including Kenetic Aviation, McKean, McLachlan, and McKibben, demonstrate stronger safety records with minimal incidents, making them safer choices.
- The landing phase emerges as the most critical and accident-prone stage of flight, underlining the need for heightened pilot attention and precision.
- Accidents are influenced not only by aircraft make but also by pilot experience, operational procedures, and adherence to safety protocols.

RECOMMENDATIONS

- **Prioritize Safer Aircraft Makes:**
Focus on operating aircraft with lower historical accident rates, such as Kenetic Aviation, McKean, and McLachlan.
- **Exercise Caution with Higher-Risk Makes:**
Conduct thorough risk assessments for aircraft like Cessna and Piper before use.
- **Enhance Pilot Training:**
Emphasize critical phases like **landing**, emergency procedures, and decision-making under pressure.
- **Strengthen Safety Protocols:**
Regularly update operational and maintenance procedures based on accident trends.

NEXTSTEPS

- **Short-Term Pilot Training:**
Schedule sessions focused on high-risk flight phases, especially landing procedures.
- **Aircraft Risk Review:**
Conduct immediate risk assessments for higher-risk makes and adjust operational decisions accordingly.
- **Update Safety Policies:**
Revise protocols and checklists to address insights from accident trends.
- **Monitoring & Reporting:**
Begin systematic tracking of aircraft performance and pilot adherence to safety standards.

THANKYOU

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