

AIRCRAFT SAFETY ANALYSIS

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01

OVERVIEW

As businesses seek growth in a dynamic market, expanding into aviation presents exciting opportunities along with considerable risk.

This project helps a company new to aviation navigate its entry by identifying aircraft models with the best safety records.

By analyzing real-world accident and survivability data, i provide clear investment guidance centered on safety and operational reliability.



THE PROBLEM

- The company is exploring a new aviation venture.
- Aircraft safety directly impacts financial risk, liability, and brand reputation.
- With hundreds of models available, which aircraft should we prioritize for investment?



THE SOLUTION

- Use historical aviation incident data to objectively assess the safety of aircraft models.
- Quantify risk based on fatality rates, injury levels, and survivability.
- Deliver clear, actionable recommendations aligned with business goals.



DATA AND TOOLS USED

SOURCE

National
Transportation
Safety Board
(NTSB)

SCOPE

Aircraft
accident and
incident data
from 1962 to
2023

TOOLS

Python (pandas,
seaborn,
matplotlib),
Tableau for
visualization



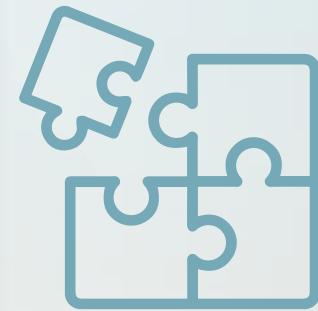
02

DATA UNDERSTANDING AND ANALYSIS

Understanding the Data:

- Key Variables:
 - Make and Model
 - Fatal Injuries, Serious Injuries, Uninjured Counts
 - Damage Levels (Destroyed, Substantial, Minor)
- Derived Metric: Safety Score = Uninjured - (Fatalities + Serious Injuries)

ANALYSIS APPROACH



ONE

Descriptive statistics
and data cleaning



TWO

Feature engineering
(Safety Score)



THREE

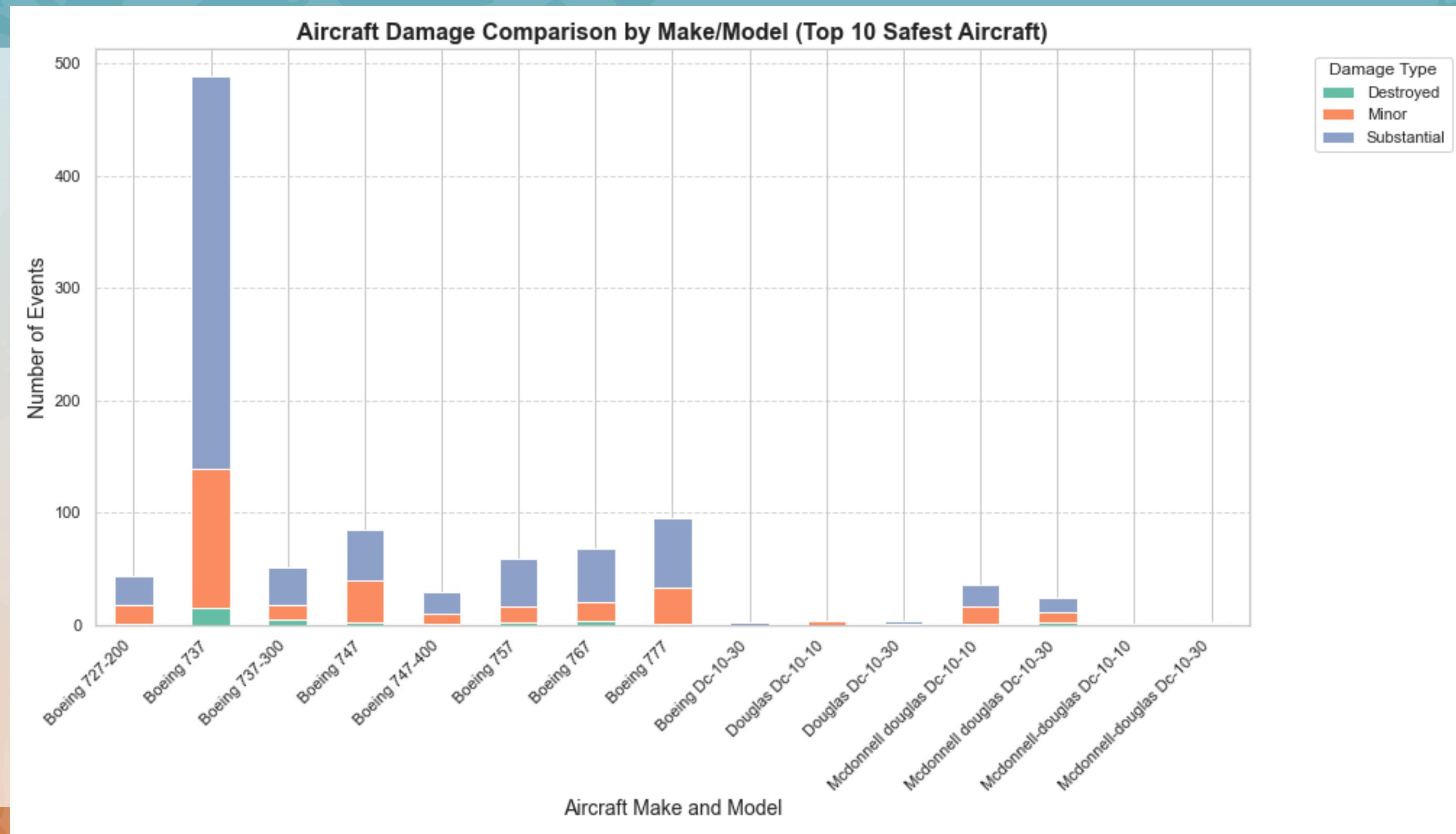
Visualization of damage
patterns and injury
distributions



FOUR

Comparative safety
analysis across
models

DAMAGE BY AIRCRAFT MODEL

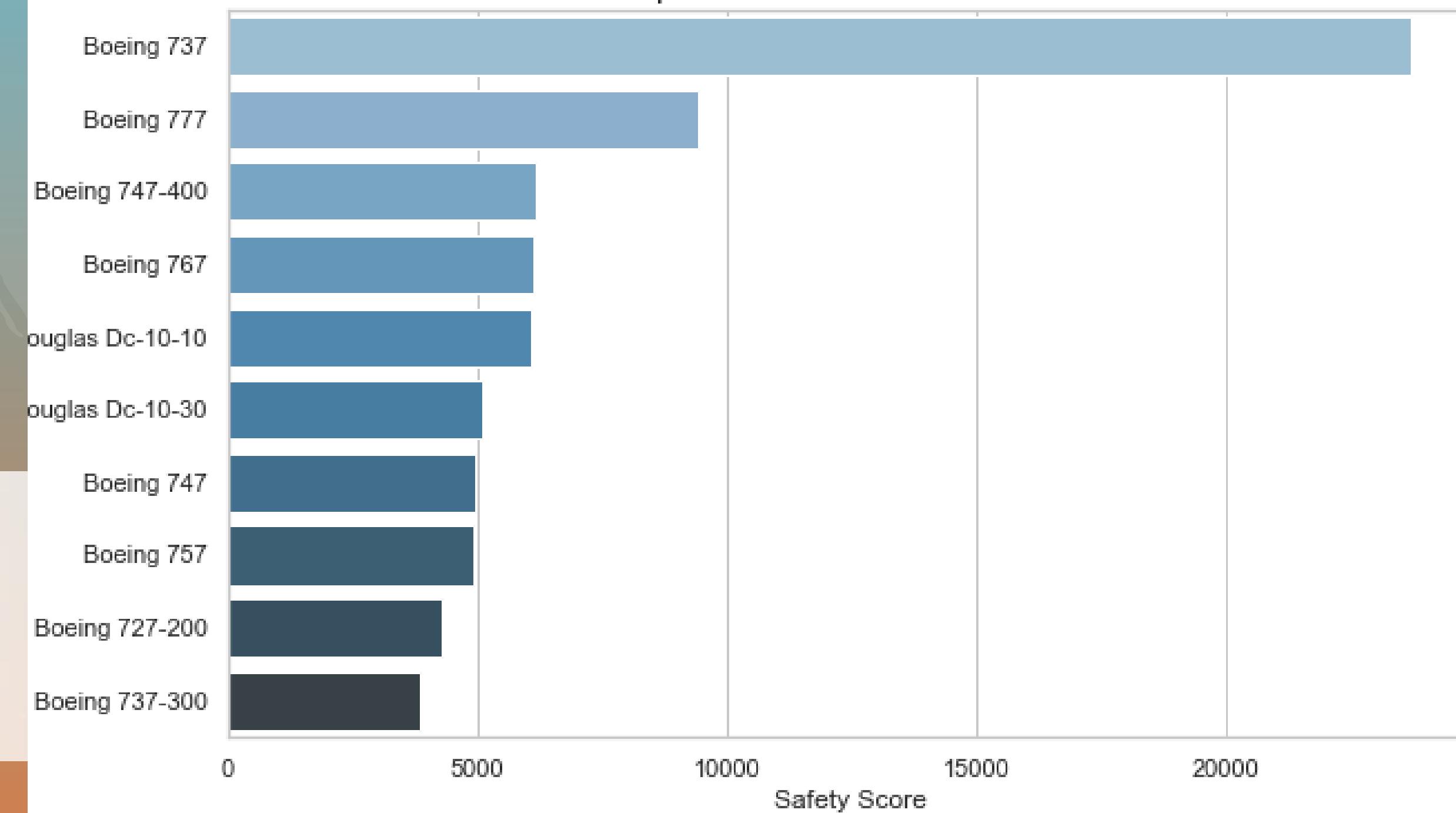


FINDINGS

- Boeing 737 and 747 families had the highest incident counts, largely due to fleet size.
- Boeing 777 and 767 showed lower damage rates despite extensive service records.
- DC-10 models consistently showed higher serious damage proportions.

SAFETY SCORE COMPARISON

Top 10 Safest Aircraft Models



FINDINGS

- Boeing 737 ranked highest in safety based on composite metrics
- Boeing 747-400 and 777 followed closely with strong scores.
- Newer Boeing 737 models performed well but showed wider variability due to exposure.
- DC-10s (all variants) had some fairly good safety scores.

03

RECOMMENDATIONS

- Priority Investment: Boeing 777 – safest across all categories
- Strong Candidates: Boeing 747-400 and 767 – durable, lower serious incident rates
- Moderate Risk: Newer Boeing 737s – good performance but high exposure risk.
- Avoid Investment: DC-10 series – aging, poor safety track record



CONFIDENCE AND LIMITATIONS

- Confidence Factors:
 - Data completeness from NTSB over 60+ years
 - Use of multiple safety dimensions
- Limitations:
 - Differences in usage context (passenger vs cargo)
 - Exposure bias for popular models like the 737

NEXT STEPS AND FUTURE WORK

ONE

Incorporate financial cost-benefit alongside safety



TWO

Explore predictive models for future incident likelihood



THREE

Update analysis annually as new incident data becomes available



FOUR

Expand dashboard with filters by year, region, and operator

"In aviation the cost of getting it wrong is measured not just in dollars, but in lives. Data doesn't just tell a story, it saves lives."



THANK YOU



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