Aviation Safety Analysis & Aircraft Acquisition Recommendations

Presented by: Lilibeth Chepngetich Langat
Contact: beth13lilib@gmail.com

Introduction / Agenda

- Why aircraft risk analysis matters
- What data was used
- How safety was measured
- Key findings on models, engines, and flight purposes
- Recommendations for aircraft acquisition
- Future considerations

Business Context / Problem

- Your company plans to purchase and operate airplanes but lacks clarity on which aircraft types pose the lowest operational risk.

- The challenge is to identify aircraft configurations with the lowest likelihood of fatal or severe accidents, using historical crash data.

Solution Approach

To guide decision-making, I conducted a data-driven safety evaluation focusing on:

- Aircraft Make/Model
- Engine Type & Engine Count
- Flight Purpose & Associated Injury Severity

The goal was to find configurations with consistently low fatalities rather than simply low accident counts.

DATA OVERVIEW

Dataset Used: Aviation Accident Database (After Cleaning)

Column Category	Key Variables used
Aircraft Specs	Make/Model, Engine Type, Number of Engines
Operation Context	Flight Purpose (Commercial, Personal, Business, etc.)
Outcome Metrics	Fatal, Serious, Minor Injuries & Uninjured Counts

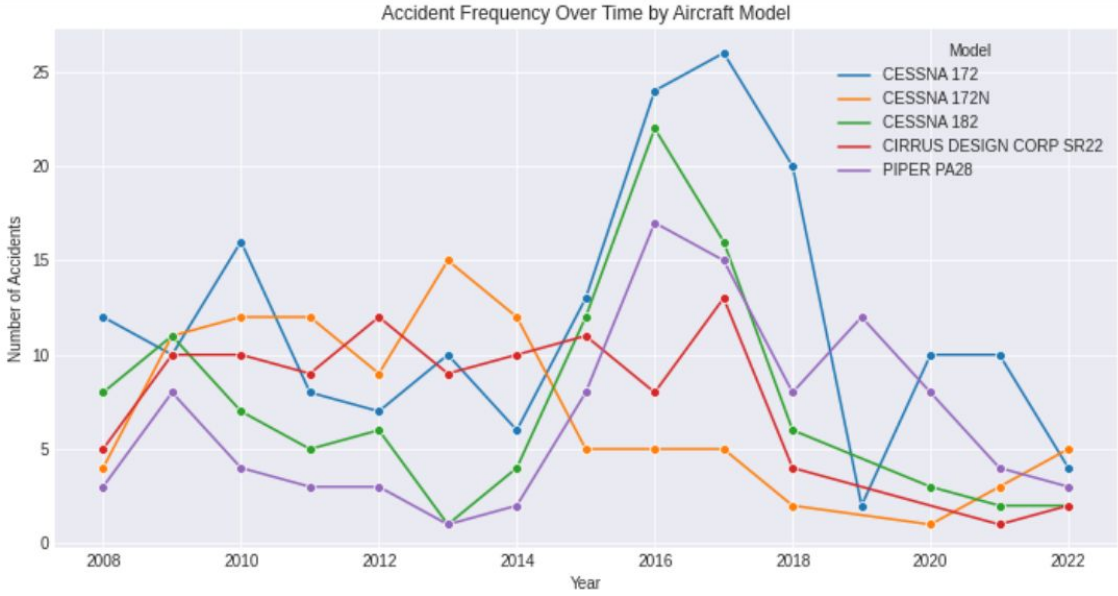
Methodology Summary

Type of Analysis: *Descriptive Risk Assessment*

- Grouped aircraft by configuration
- Calculated average fatalities per accident
- Identified lowest-risk categories
- Visualized patterns to support decision-making

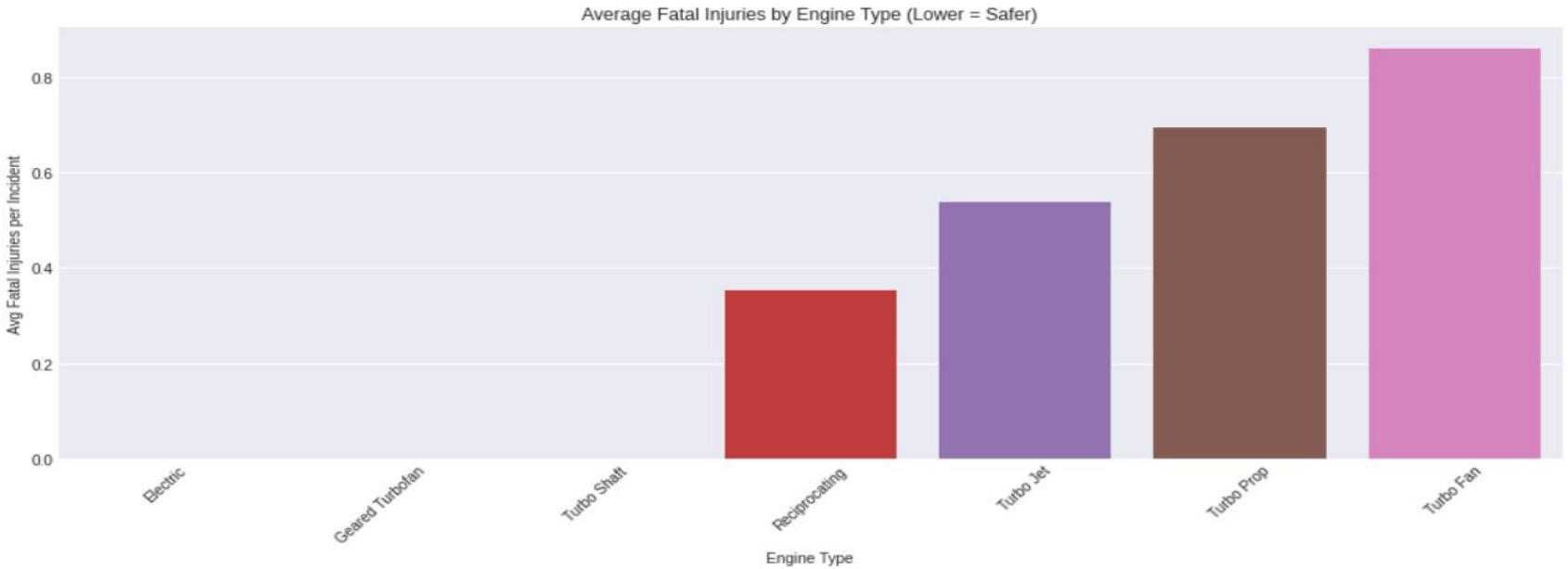
Recommendation 1: Safest Aircraft Make/Models over time

Rather than selecting models based only on lifetime fatality averages, models that show a *declining accident trend over time* are more reliable long-term investments.



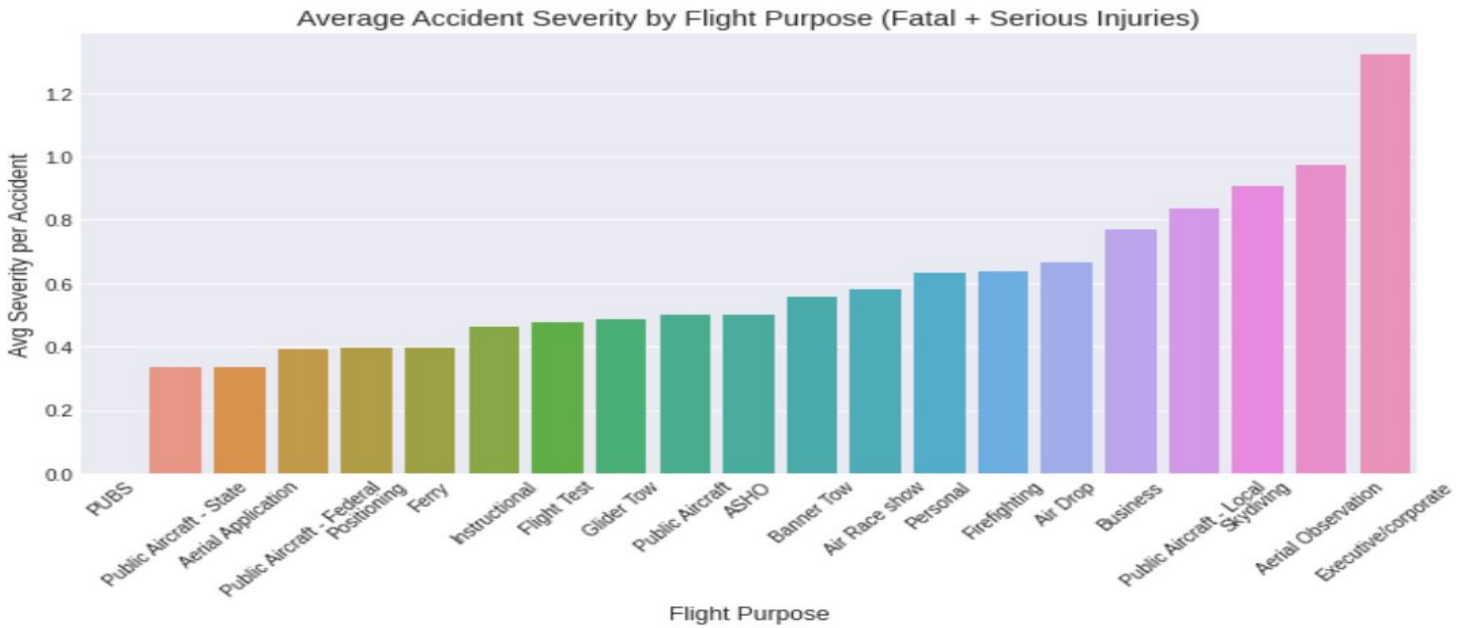
Recommendation 2: Best Engine Type CONFIGURATIONS

Some engine configurations demonstrate superior failure tolerance as seen in the chart.



Recommendation 3: Safer Flight Purpose

Flight purposes associated with structured or professionally managed operations tend to show lower average injury severity, while more irregular or high-risk use cases show higher severity.



CONCLUSIONS

- Engine safety varies significantly, lower-risk options like Geared Turbofan and Electric engines outperform traditional turbofan/turboprop setups in fatality rates.

- How an aircraft is used matters as much as what it is, regulated or professionally operated flight purposes tend to show lower injury severity than recreational or personal use.

- Some aircraft models are getting safer over time — models like the Piper PA28 and Cessna 182 show declining accident trends, making them stronger long-term candidates.

Next Steps

- Prioritize low-fatality engine configurations and avoid high-risk setups unless mission-critical.
- Align aircraft purchases with lower-risk flight purposes, or reinforce riskier categories with stricter training and safety protocols.
- Shortlist models with improving safety records for deeper financial evaluation.
- Compare top models on insurance, fuel efficiency, and maintenance to find the best safety-to-cost balance.
- Investigate high-risk flight operations to determine whether they should be avoided or better managed.

THANK YOU!

Email: beth13lilib@gmail.com

GitHub: https://github.com/lilibethlangat

LinkedIn: https://www.linkedin.com/in/lilibeth-langat/