Aircraft safety Risk Assessment

Using data driven insights to Guide to provide recommendations on low-risk aircraft model for commercial and private operations

Overview: Business understanding

- The organization is entering aviation for portfolio diversification
- The company being new to aircraft enterprise, lacks experience in aircraft risk assessment.
- We must therefore analyse US Aviation Accidents and Incident Database and recommend on low-risk aircraft before initial purchase.

Overview of the aviation industry

- Aircraft vary widely in their safety records depending on manufacturer, model, maintenance history, usage, and geography.
- While modern aircraft are statistically very safe, historical data shows that certain models and types have accidents rates often linked to operational environment, mechanical complexities or outdated systems.
- a good safety record of an airline is critical towards its operational market, survival, reputation, prestige and most importantly passengers' confidence towards its service offered.

Data Understanding

- Source of Data: US Aviation Accident and Incident Database from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters and US States Code data
- Analysis Categories
  - Make/model
  - Aircraft Category
  - Purpose of flight
  - Injury Severity
  - Aircraft damage
  - Weather Condition
  - Event count and injuries numerical variables

Data Analysis

- Approach used for analysis
- Data was analyzed using Descriptive Statistics and Risk metrics creation of make and model variables to determine the safest make model by fatality rate
- Creation of purpose of flight risk metrics to evaluate aircraft safety risks based on purpose of flight
- Creation of state operation risks metrics to analyze operational risks per state region
- Tools: Python, Pandas, Seaborn and Matplotlib

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Analysis Categories:

1. Aircraft Make/Model
2. Purpose of flight
3. US state/Territory

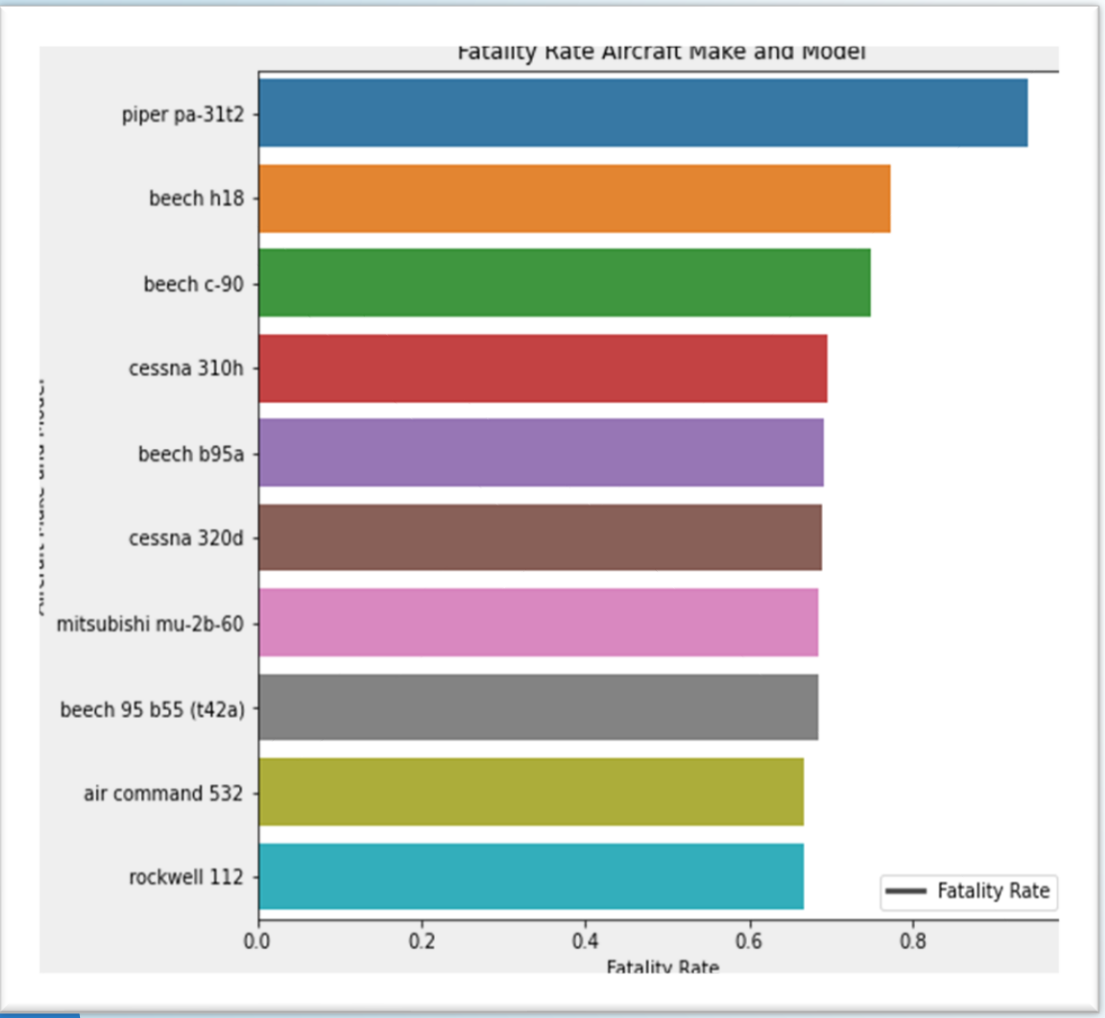
Key metrics:

Fatality Rate= Fatal injuries / Total People

Injury Rates= (Fatal + Serious + minor injuries) / total people

Incident Count(for significance)

Findings:
Risk by Aircraft make and model



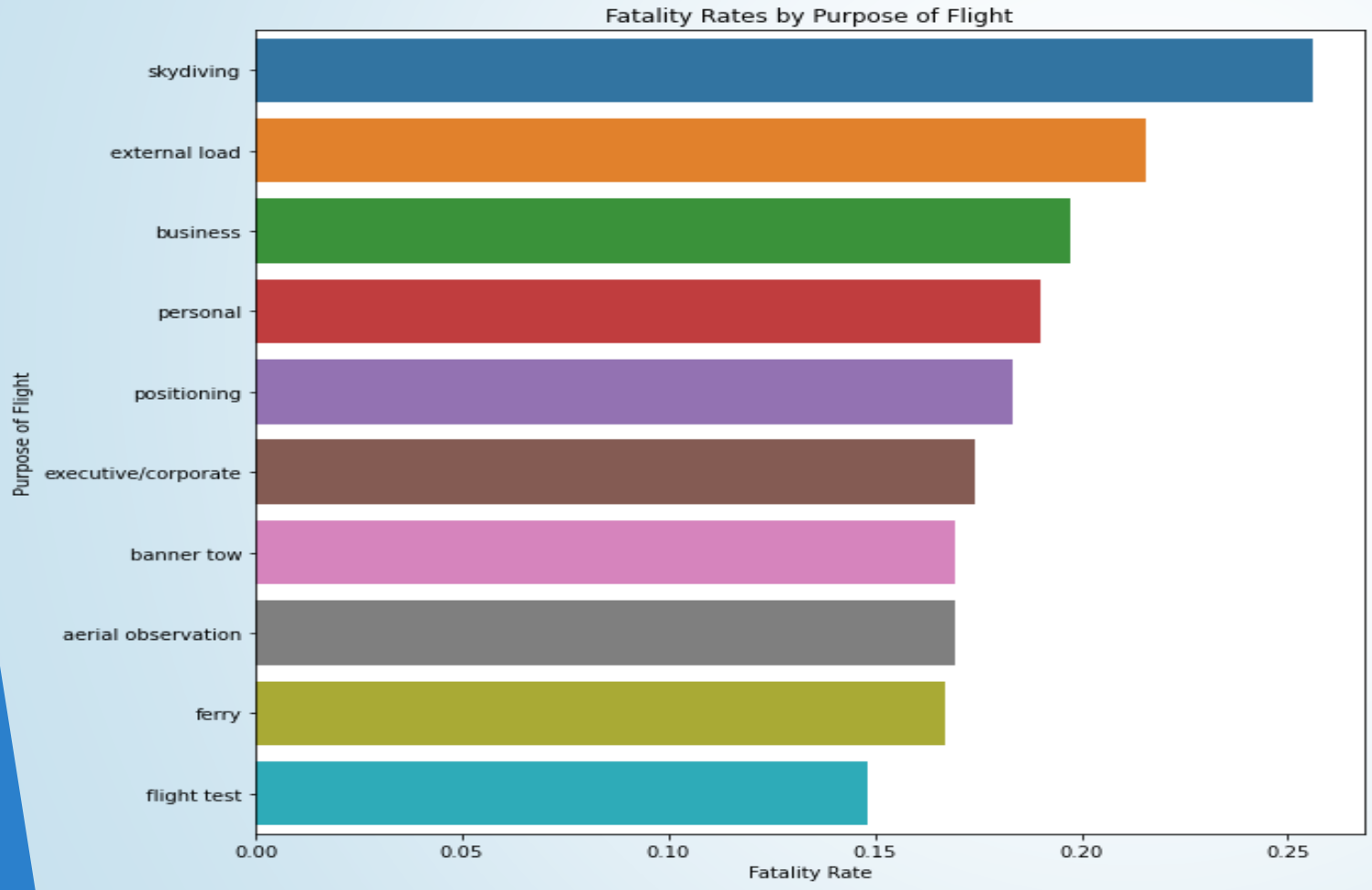
Top findings

High Risk: Piper PA-31T2, Beech H18 with 80% fatality rate

Moderate: Cessna 310H, 320D,BEECH B95A and Mitsubishi MU-2B-60

Low Risk: Air Command 532, Rockwell 112

Risk rate by Purpose of flight



High Risk Purpose:

- Skydiving(25%) risk rate

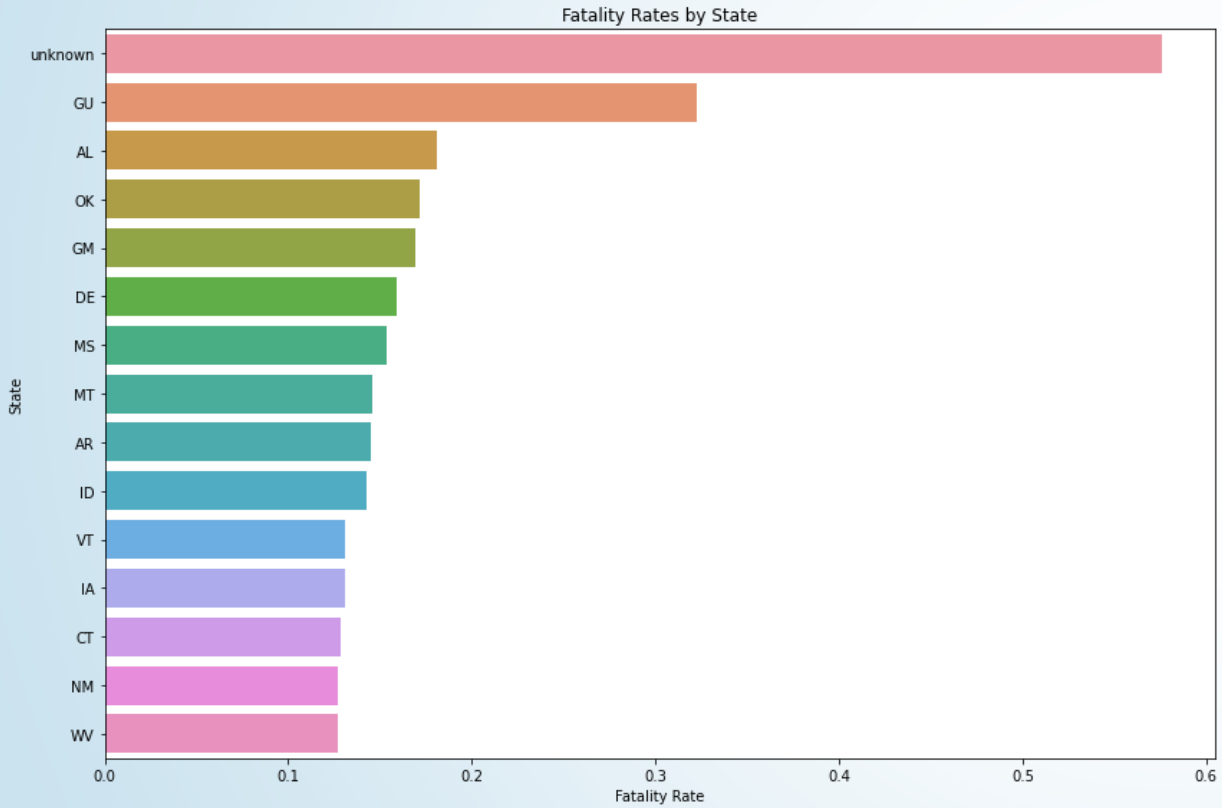
Moderate Risk:

- executive/corporate(16%)

Low Risk:

- Flight test (17%)

Fatality Rates by State



Top Findings:

High Fatality Rate state: Guam (highest)"Unknown" – missing data suggests gaps in reporting

West Virginia have less than 15% fatality rate which makes it ideal for aviation operations.

Recommendations

- **Aircraft to acquire**: Air Command 532, Rockwell 112 are the safest aircraft models, Piper PA-31T2, Beech H18 should be avoided initially.
- **Operations to prioritize**: Flights Tests, Consider Public Use and Personal flights with protocols since these are for private and commercial business. Skydiving should be avoided due to high fatality rates
- **Locations to be considered**: West Virginia, Connecticut, New Mexico, Guam should be avoided since it has the highest fatality rate

What next?

- Perform cost analysis on recommended models
- Investigate data gaps

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Thank you