Aircraft Risk Analysis for Investment Decisions

Business problem

- The organization is planning to diversify its portfolio by entering the aviation industry through the purchase of aircraft for commercial and private use

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- While this offers new growth opportunities, it also introduces substantial risks. Hence, a thorough risk assessment is required to ensure the investment is viable and sustainable.

Project Goal

To identify the aircraft with the lowest risk for company to venture in.

DATA SOURCE & DATA ANALYSIS PROCESS

Source: Kaggle, National Transportation Safety Board that includes aviation accident data from 1962 to 2023 about civil aviation.

Data Analysis process

Steps

1. **Cleaning data** to handle the missing values and ensure consistency

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2. **Exploratory Data Analysis** Analysing trends and patterns in accidents by Phase, Weather, Flight purpose, number of engines and aircraft make.

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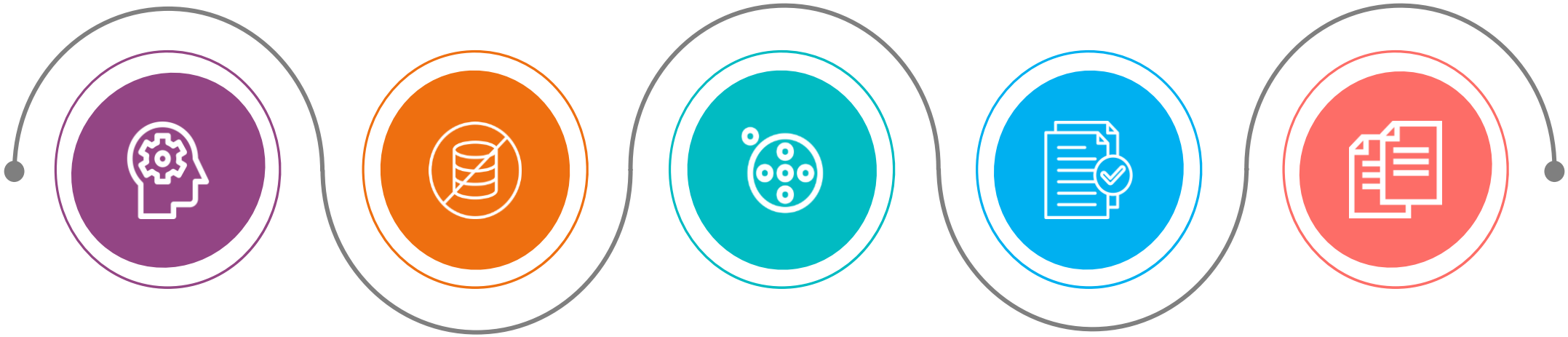
3. **Visualization** : Interactive charts and dashboards created in Tableau and also with seaborn &matplotlib in jupyter notebook for different stakeholders' utilization

Data Cleaning Process



Profiling

Dropped ‘Aircraft Category’ due to

Excessive missing values

Handle Missing Values

Filled missing values in injury-related columns with 0

Handling Categorical data

Filled missing values in categorical fields with mode

Outlier Handling

Filled missing ‘Number .of.Engines’ with median

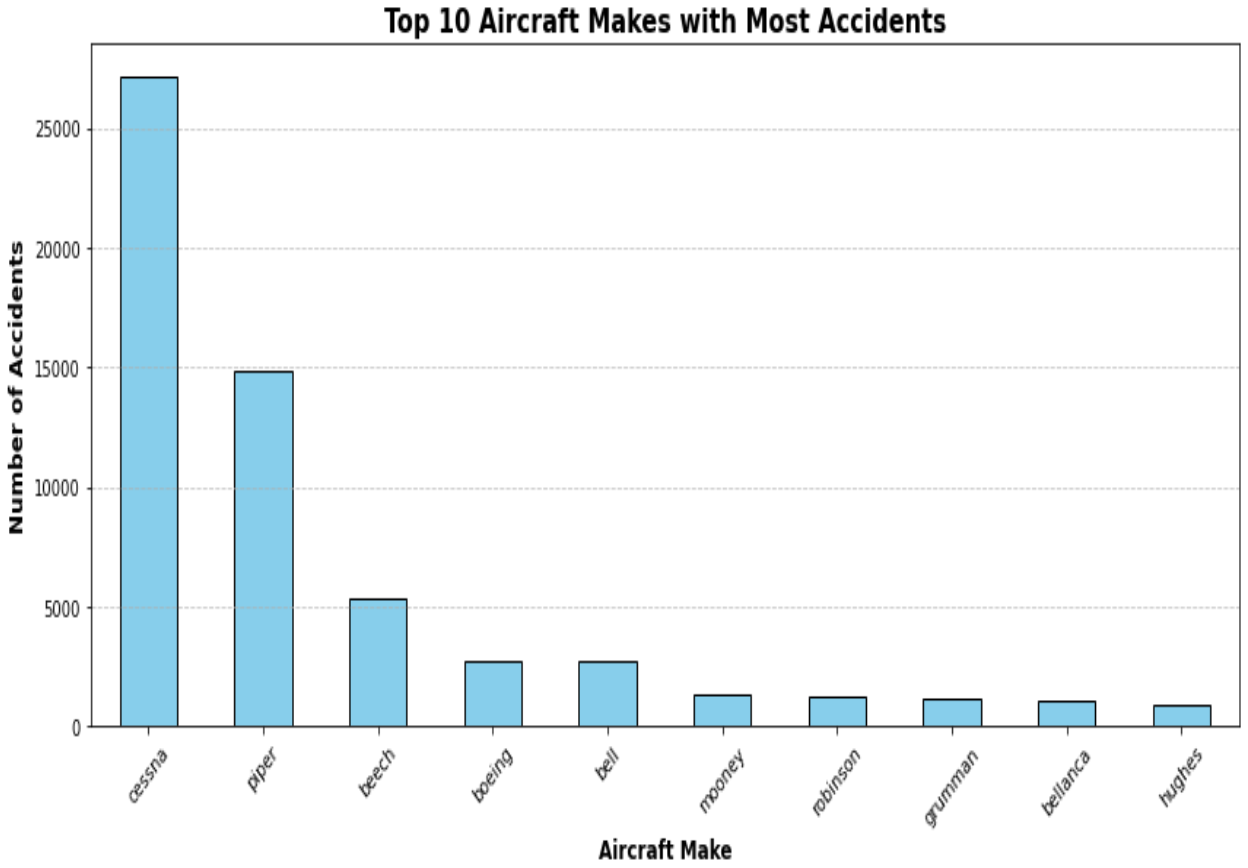
Validation

Check data for accuracy.

Key Findings

Top 10 Aircrafts Make Involved in Accidents

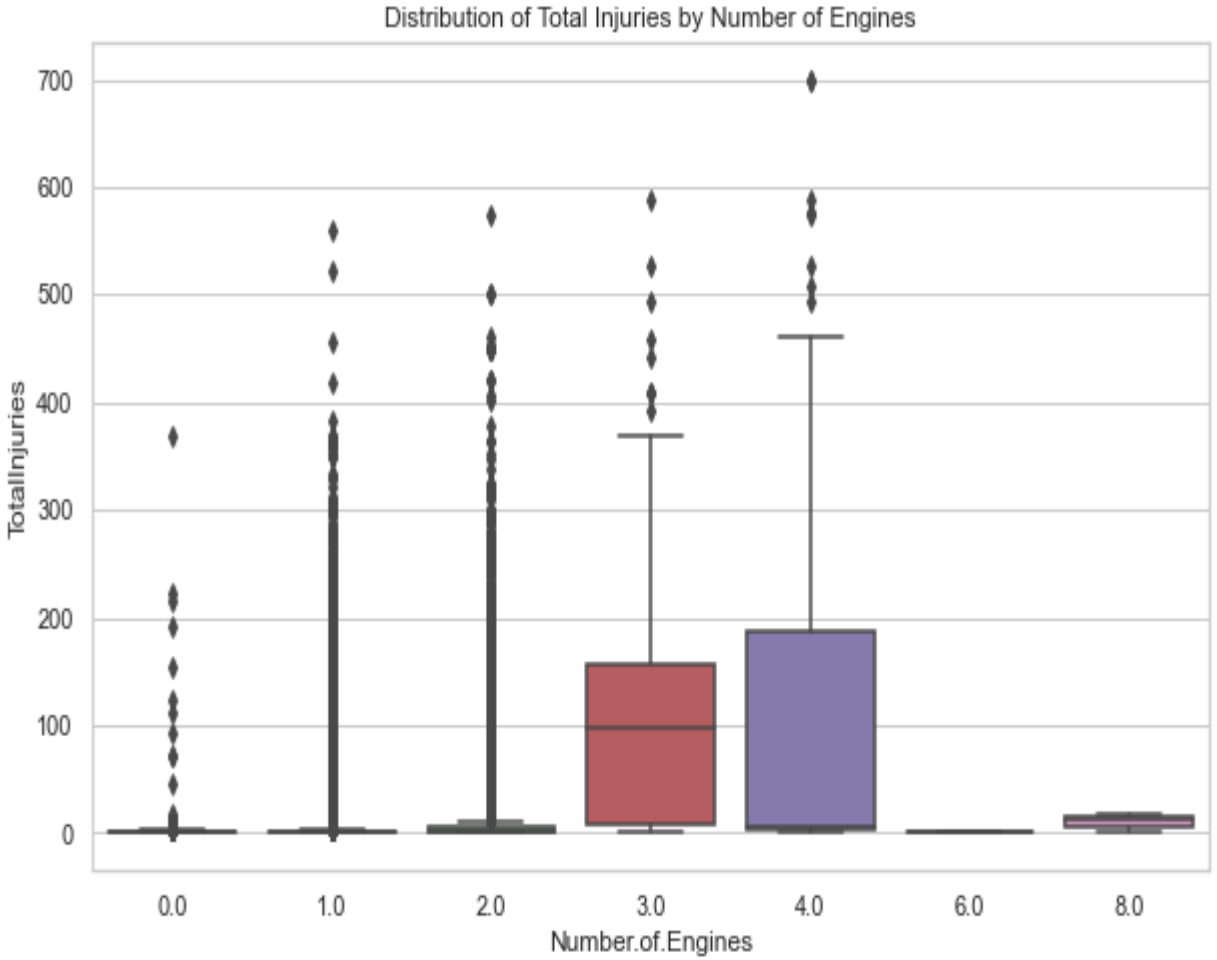
- Cessna and Piper aircraft have by far the highest number of accidents, significantly more than any other manufacturers.
- Beech and Bell follow, but with far fewer cases. Boeing appears in both accident and incident records, with numbers that are close but still relatively low compared to Cessna and Piper.
- Other makes like Mooney, Robinson, Grumman, and Bellanca show smaller but still notable accident counts.



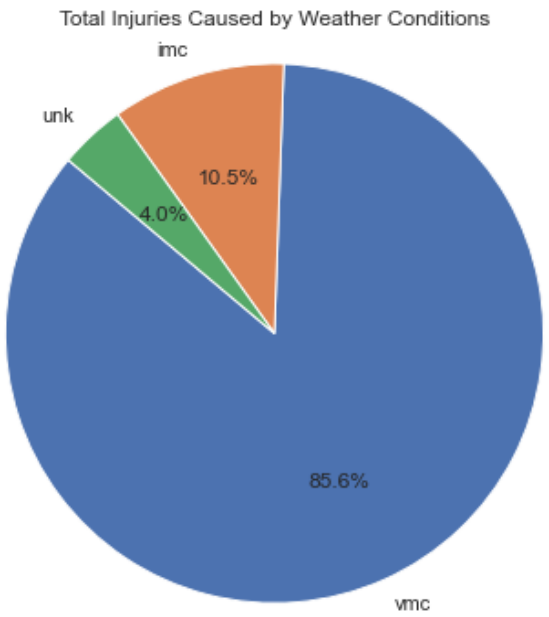
Key Findings Cont.

Distribution of Total injuries by number of Engines

- **Aircraft with 0–2 engines** generally have lower median injury counts. However, there are many outliers, meaning that while most incidents are minor, some accidents result in severe injuries.
- **Aircraft with 3–4 engines** show significantly higher median injury counts and a wider spread of injuries. This suggests that accidents involving these aircraft tend to be more severe and less predictable.
- **Aircraft with 6–8 engines** have relatively few recorded incidents.



Key Findings cont.



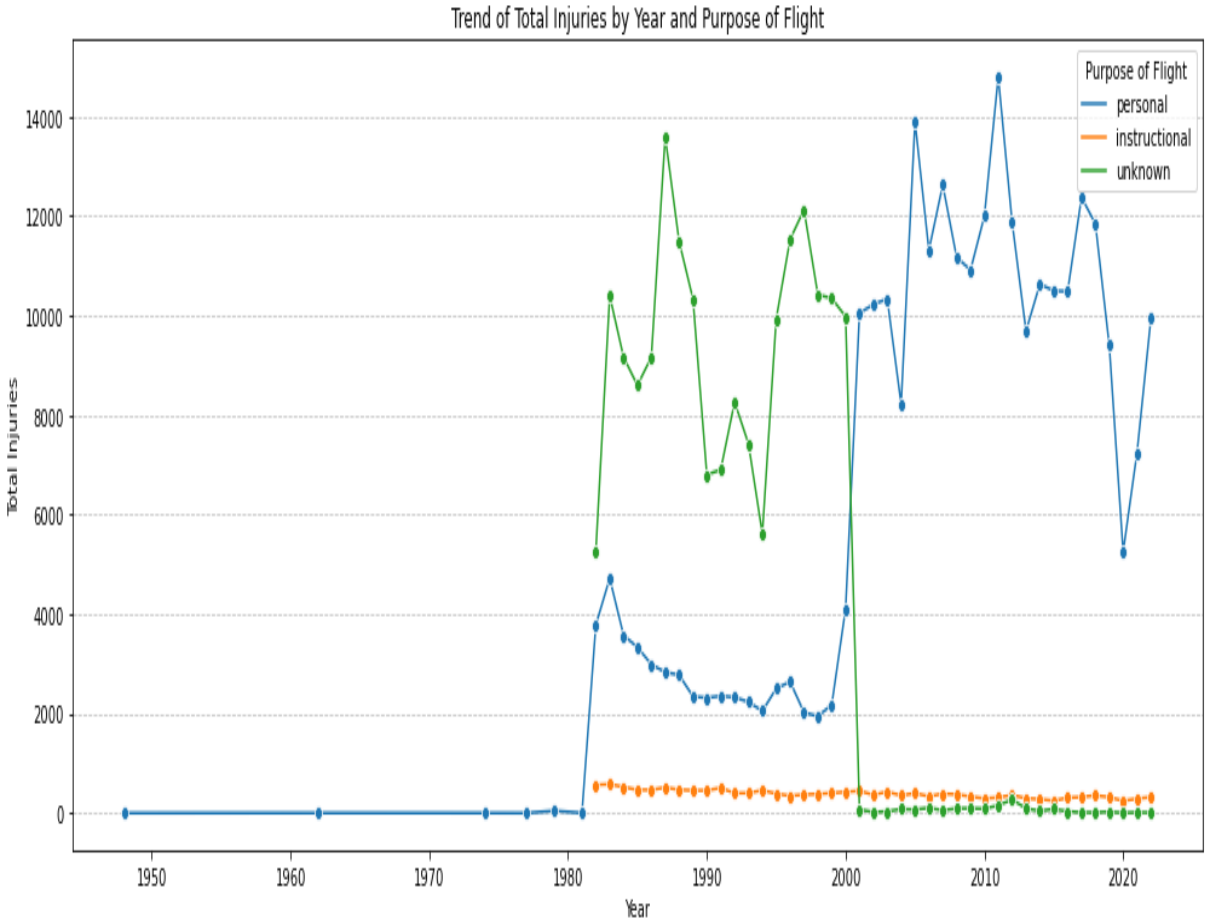
The count of injuries incurred due to different Weather conditions

- VMC accounts for the highest number of injuries at 85.6 %. This means that most accidents and resulting injuries happen when the weather is generally clear, and visibility is good.
- IMC accidents under poor visibility conditions account for 10.5% injuries. This is significantly lower than in VMC, but still notable.
- There were also 4.0% injuries reported under unknown weather conditions.

Key Findings cont.

Accidents Incurred During Different Flight Purposes

From the line graph, it is evident that most injuries occur during personal flights over the years, followed by flights with an undefined or unknown purpose. Instructional flights rank third in terms of injury frequency.

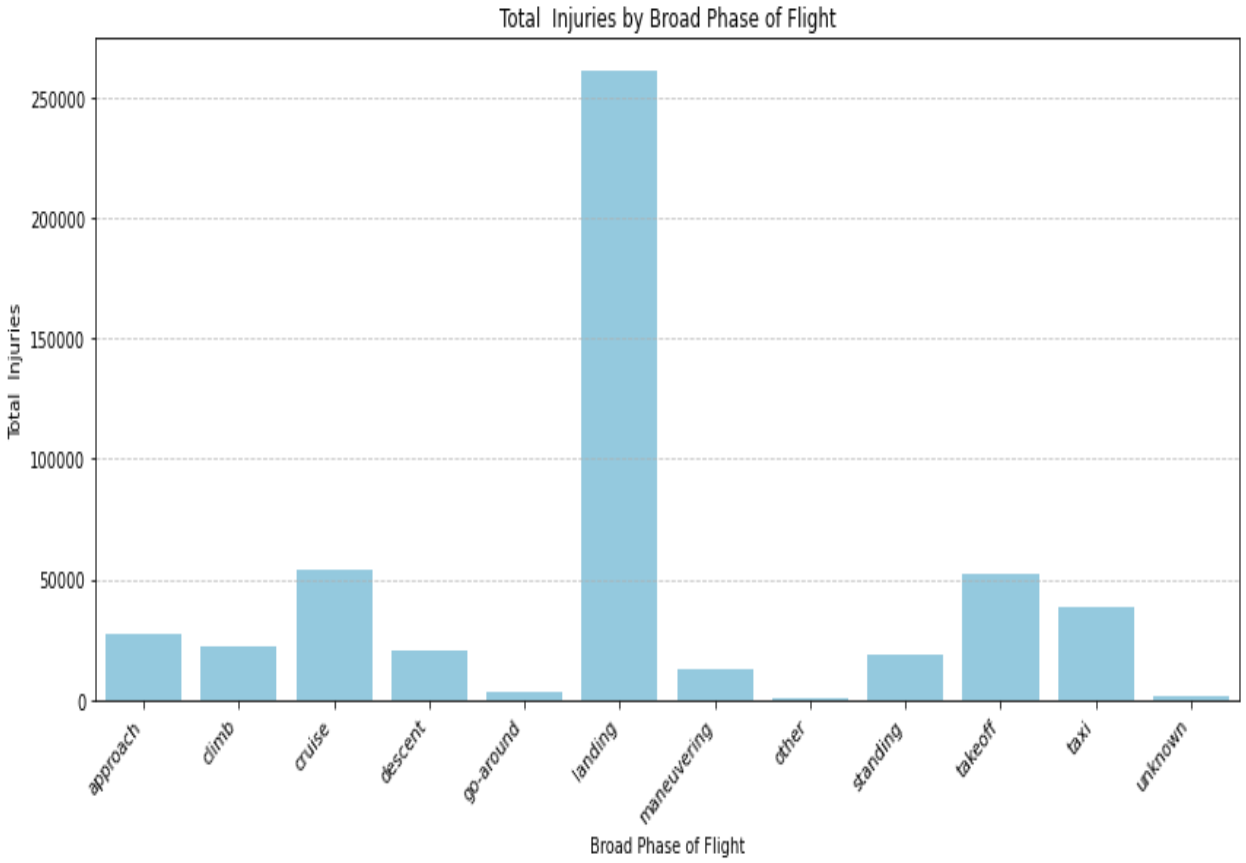


Key Findings cont.

Count of Occurrences per phase of Flight

The bar plot indicates that the highest number of injuries occur during the landing phase of flights, followed by injuries during cruise, takeoff, taxi, and approach phases, in that order.

This pattern highlights that the landing phase presents a higher risk of accidents compared to other phases of flight.



Recommendations

Prioritize investment in aircraft models with lower accident rates; Cessna and Piper models pose higher operational and insurance risks.

Good weather does not eliminate accident risk; maintain caution and enhance pilot training even in clear conditions. In Instrument Meteorological Conditions (IMC), invest in aircraft with advanced avionics and navigation systems.

It is also recommended that investments should Focus investments on the instructional aviation sector, which has a lower injury and liability risk.

Invest in advanced pilot training, particularly in landing techniques, emergency landings, and adverse weather handling. In addition, invest in Equipping aircrafts with technologies like Enhanced Vision Systems (EVS), Autoland systems, and Ground Proximity Warning Systems (GPWS) to minimize accidents during Landing Phase.

Next Steps

First step

Collaborate with other stakeholders in Aviation Industry to implement the strategies and Recommendations above.

Second Step

Evaluate Insurance implication to the company based on the risk assessment conducted

Third Step

Lastly, Continuously monitor the Investment strategy.

Thank You

For further inquiries or collaboration opportunities, feel free to reach out.

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