Project Title:
Risk Assessment of Aircraft for Commercial and Private Operations

1. Business Understanding

PROJECT GOALS

- To analyze 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.
- To determine which aircraft are the lowest risk for the company, translate the findings into actionable insights that the head of the new aviation division can use to help decide which aircraft to purchase.

DATA SOURCE

The NTSB aviation accident database contains information from 1962 and later about civil aviation accidents and selected incidents within the United States, its territories and possessions, and in international waters.

KEY QUESTIONS:

- Which aircraft type have the lowest accident rates?
- Are there specific manufacturers associated with higher safety standards?
- How do accident severities vary across aircraft types and manufacturers?
- Are there specific times, places, or circimstances under which the risk is heightened for certain aircraft types?

SUCCESS CRITERIA:

- Identify aircraft that have a low accident frequency and severity history
- Provide actionable recommendations on model of aircraft that fit the company's operational needs.

2. DATA UNDERSTANDING & PREPARATION

- Size of the data (88889, 31)
- Resized the data

Drop columns that have roughly more than 25% of their data missing

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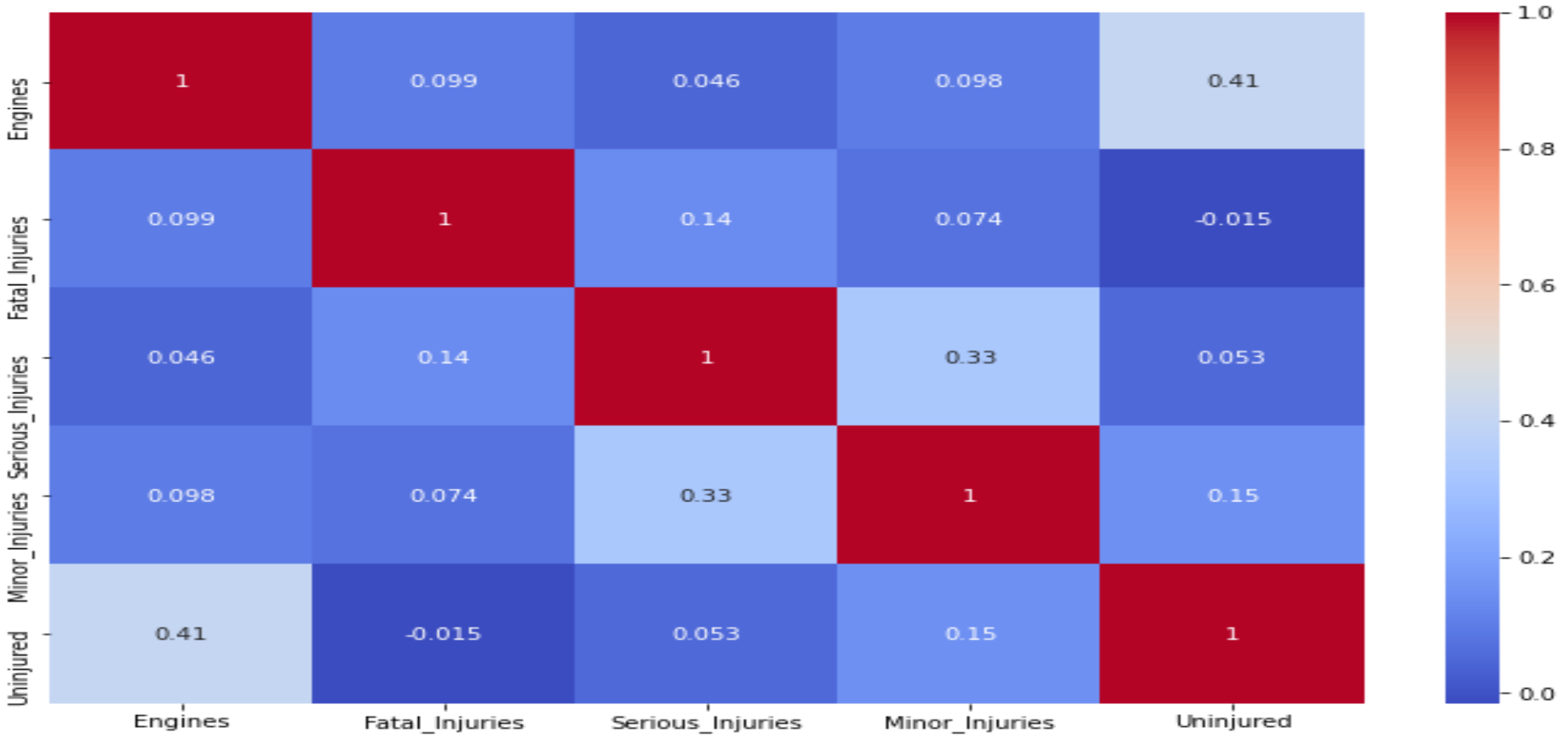
# More columns which are not important for my analysis, i drop for easier halnding of the data
columns_to_drop = ['Latitude', 'Longitude', 'Airport.Code','Accident.Number', 'Registration.Number',
                   'Amateur.Built', 'Publication.Date', 'Report.Status', 'Engine.Type',
                   'Airport.Name','Aircraft.Category', 'FAR.Description', 'Schedule',
                   'Air.carrier', 'Broad.phase.of.flight']
```

DATA UNDERSTANDING & PREPARATION

- Renamed some columns in the Data Frame to make the Data readable.
- Standsrdize the Injury_severity & Fatal_injuries .The columns provide the same information
- Drop Fatal_Injuries column

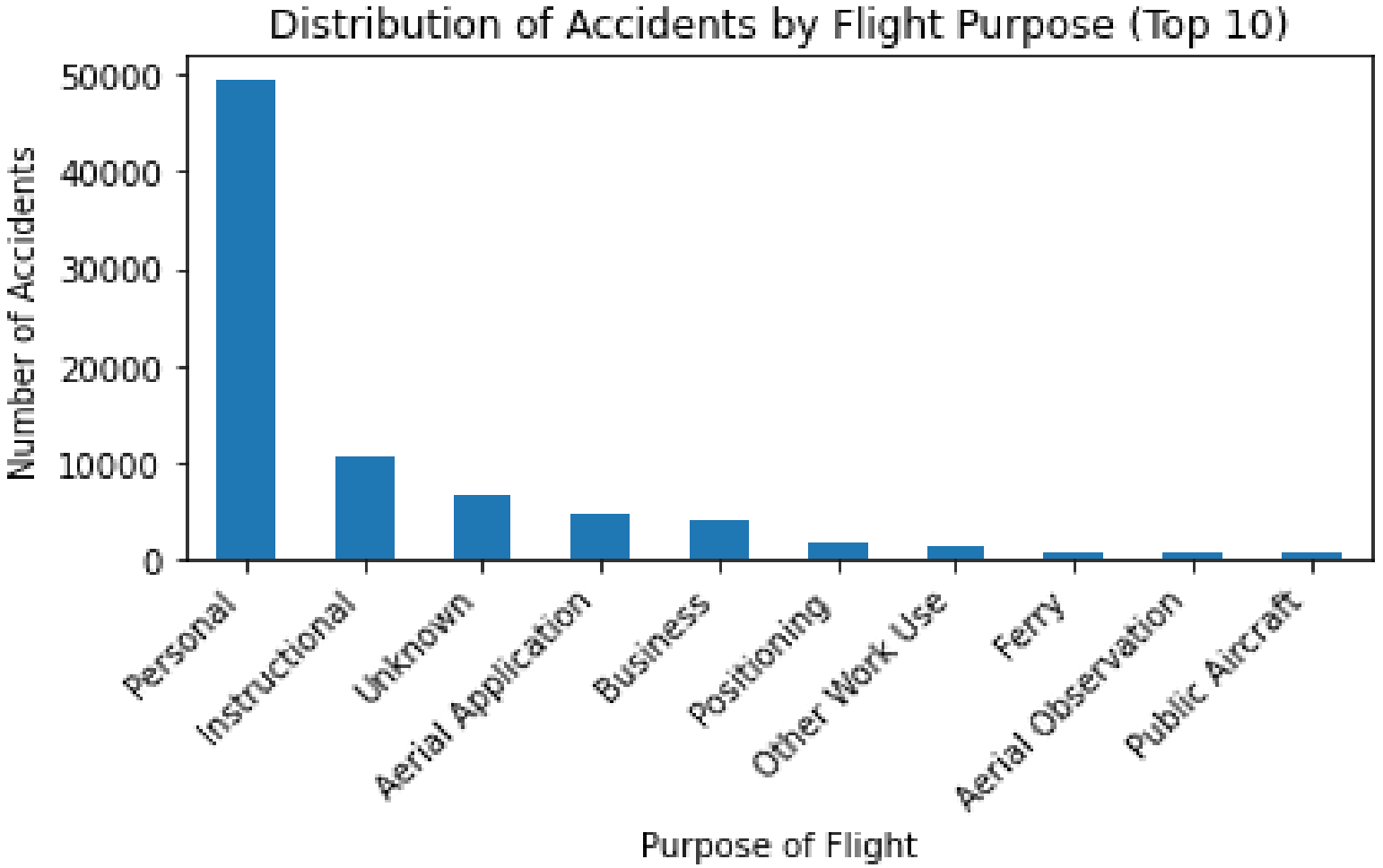
EXPLORATORY DATA ANALYSIS (EDA)
HEATMAP



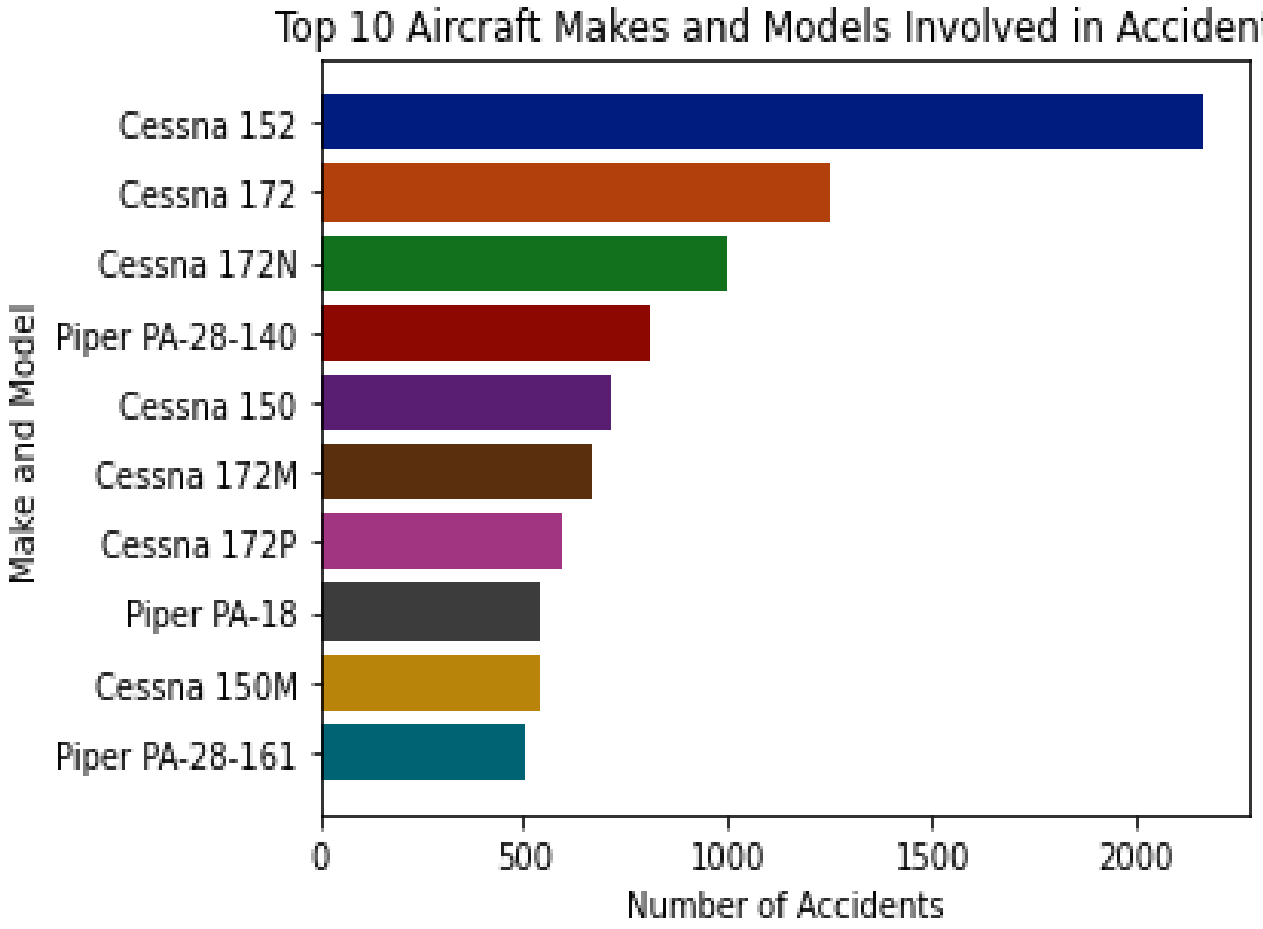
OBSERVATIONS

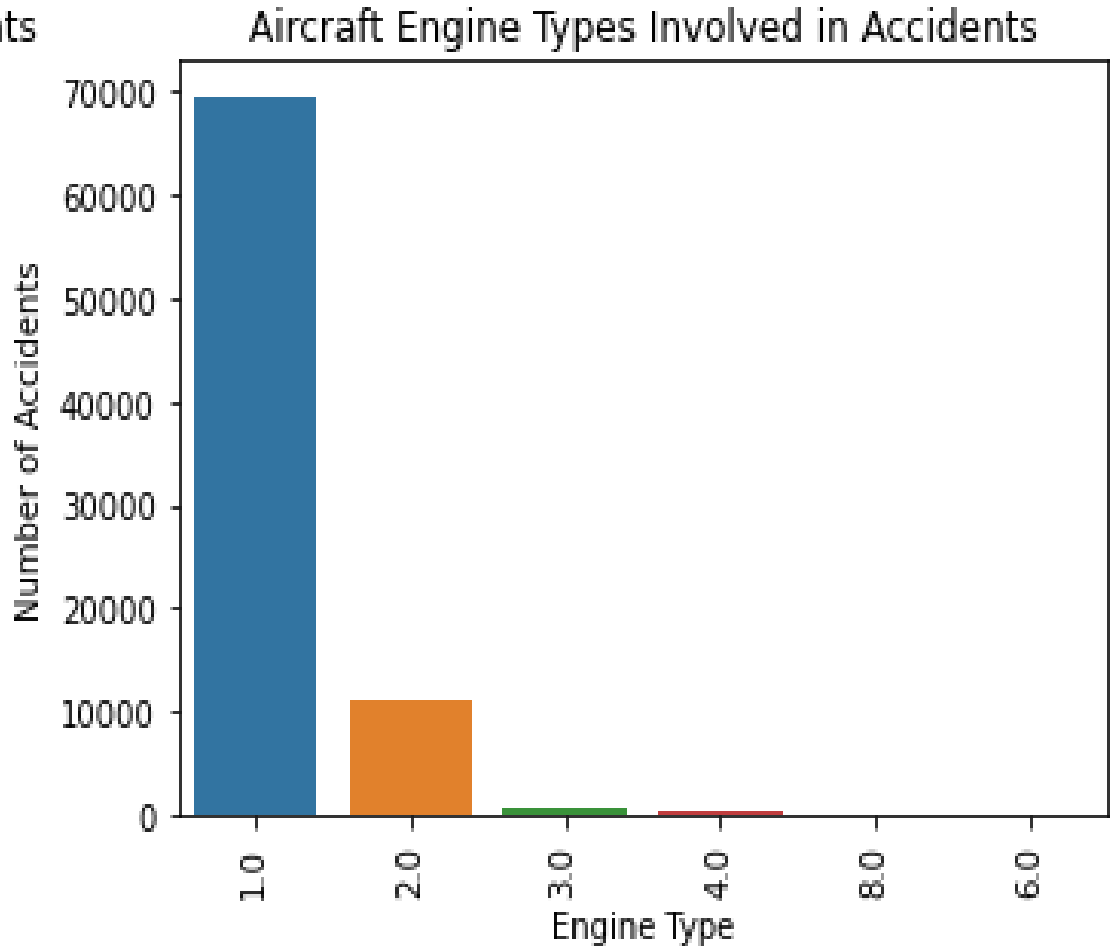
- Positive correlation: Engines and minor_injuries there is a strong postive correlation between these two variables by suggeting that as the number of engines increases the number of of minor injuries tends to increase.
- Negative correlations: Engines and Uninjured show a moderate negative correlation as the number of engines increases, number of uninjured individuals tends to decrease.
- The heatmap suggests that there might be a relationship between the number of eingine systems and likelihood of accidents and injuries.

DISTRIBUTION OF ACCIDENTS BY FLIGHT PURPOSE (TOP 10)

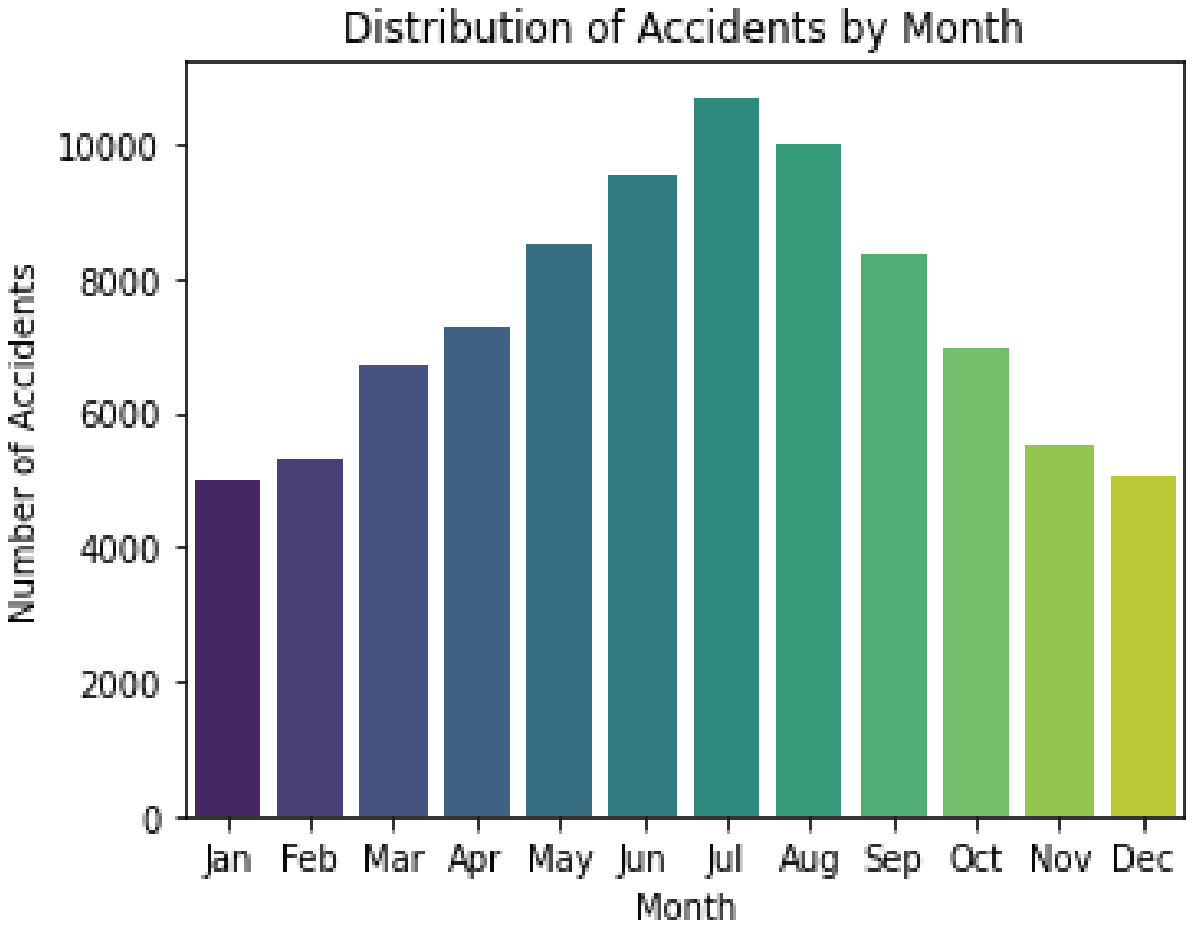


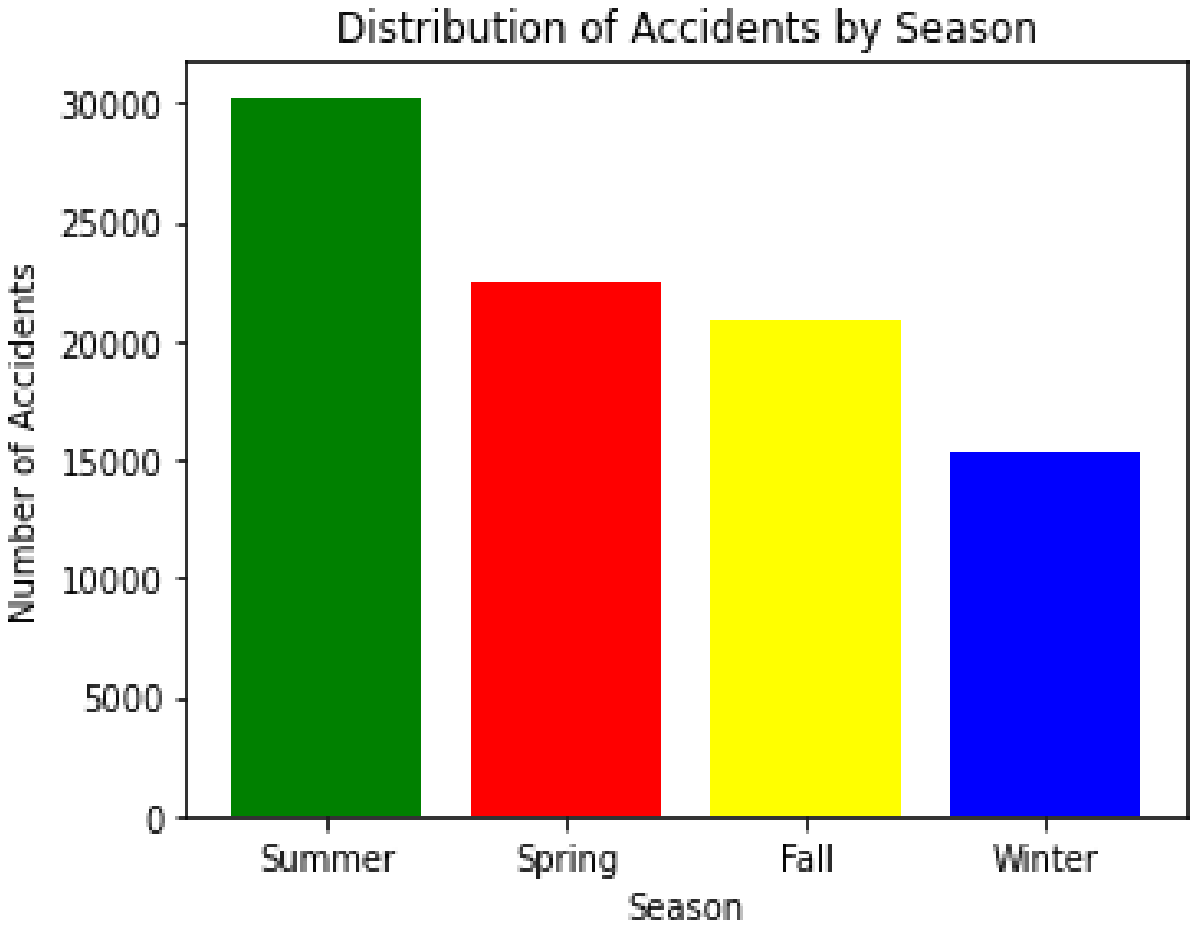
EXPLORING WHAT MAKE, MODEL AND ENGINE TYPE INVOLVED IN MORE ACCIDENTS





DISTRIBUTION OF ACCIDENTS BY MONTHS AND SEASONS





RECOMMENDATIONS

Personal flights are responsible for a high percentage of aviation accidents. In the area of personal flights, detailed education and training courses should be encouraged for pilots. The safety-first culture has to be nourished within the community of personal aviation. Minimizing the occurrence of accidents in personal flights depends on how safety is considered the priority in every personal flying activity. Whichever the weather condition, pilots must be very prepared and informed of the possible risks to be taken in personal aviation.

RECOMMENDATIONS

- Most accidents occur in summer. In good weather, pilots may become overly confident and feel there is less risk than in poor weather conditions. This can result in a casual approach toward safety procedures and / or unsafe behavior, like flying low, going too fast, or using aerobatics, which raise the accident risk. The remedy is to encourage responsible flying practices and avoid taking unnecessary risks by proper training and awareness. It is also a re-emphasis on flying inside the safety envelope to avert accidents.

RECOMMENDATIONS

- Aircraft makes and models, and engine types, in accidents. The Cessna 152 is the highest aircraft model in the number of accidents, followed by the Cessna 172. The opposite is observed in the case of the type of engine: the "1.0" type is dominant, while all others have much lower accident numbers. These findings might indicate that higher accident rates are related to models Cessna 152 and 172, combined with engine type "1.0.". Recommendations include: (1) Targeted safety investigations into these specific models and engine types to identify potential design flaws or operational issues; (2) Increased pilot training and education for these aircraft to address any recurring factors contributing to accidents; (3) Regular maintenance and inspections of these models and engines to ensure their continued airworthiness.

NEXT STEPS

Thank You!