NAVIGATING THE SKIES: IDENTIFYING LOW-RISK AIRCRAFT FOR STRATEGIC EXPANSION INTO AVIATION

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Presentation Overview

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- Overview
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Background

•Operating airplanes for commercial and private enterprises comes with various real-world challenges.

•Some of the challenges include;

    •High maintenance and operational costs

    •Compliance with international operations and aviation regulations

    •Accidents and incidents caused by different factors including weather

    •Air traffic Congestion especially for commercial aviation

    •Demand fluctuations and competition

    •Customer experience and expectations

•In response to the evolving market dynamics, the **National Transport and Safety Board (NTSB)** is considering expansion into new markets to diversify its portfolio

• A thorough exploration of the NTSB dataset (1962 – 2023) was conducted to identify the low-risk aircraft models for strategic investments in commercial and private aviation

•Findings generated have been translated into actionable insights for evidence-based decision-making

Business understanding

- Boeing's 2024 Commercial Market Outlook (CMO) predicts air travel demand will outpace economic growth through 2043 with a forecast of nearly 44,000 new airplane deliveries over the next 20 years

- The total number of passengers is expected to reach around **5 billion** in 2024, with a load factor of **82.5%,** demonstrating high demand for air travel

- Some of the factors that significantly increase the risk of accidents in aviation as reported by Skybrary include;
  - **Weather Conditions**: Adverse weather such as thunderstorms, turbulence, and icing can be critical factors in aircraft accidents
  - **Flight Phases**: The approach and landing phases are widely considered the most dangerous, accounting for a majority of accidents
  - Other factors include; **pilot decision-making**, **aircraft design**, and **geomagnetic storms**

- Findings from this assessment will also identify some of the factors that contribute to accidents and incidences reported in the data set

Data Understanding

- The analysis utilized the [NTSB aviation accident dataset](#).

- The data covers the period between **24 October 1948** and **29 December 2022**.

- The NTSB aviation accident database contains information on civil aviation accidents and selected incidents by country, the airport names and codes, total number of events within that period, aircraft models and makes, weather conditions, phase of flights, total injuries and fatalities among other key information

- The assessment will answer the questions below;
  1) Which aircraft models have the lowest accident rates?
  2) Are there specific factors (e.g., weather conditions, flight phases) that significantly increase the risk of accidents for certain aircraft?
  3) What are the trends over time, and how do they impact decision-making for future aircraft purchases?

Data preparation

- The avaiationdata.CSV was downloaded from Kaggle and used in the analysis

- The file was imported using the appropriate functions in pandas as shown below.

```python
# import data and create df
# df = pd.read_csv("AviationData.csv") # encoding issues
df = pd.read_csv("AviationData.csv", encoding="latin-1")

#checking the first 5 columns
df.head()
```

- Columns with more than 30% null values and those that would not add any value to the analysis were dropped while others were added

Data Analysis

- The different python libraries were imported for analysis as shown below

```python
# import data analysis libraries
import numpy as np
import seaborn as sns
import pandas as pd
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings('ignore')
```

- A Juypter Notebook was used to edit and run the Python codes

Analysis – Recommended low-risk airplanes

Count of Events by Make
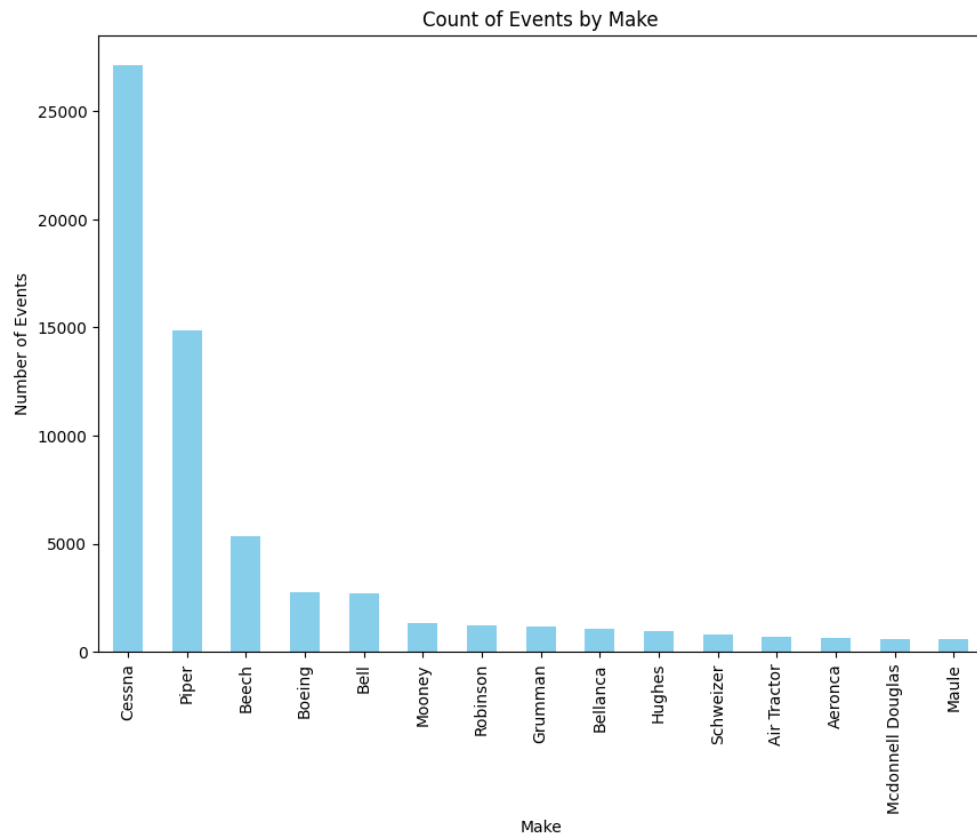
```
Bottom 10:
 Make
Mckinnis                    1
Aeronca-Bubeck Irving       1
Trike                       1
Aero Comp Inc               1
Burak Stanley A             1
Cohen                       1
Kitchens                    1
Lutes                       1
Izatt                       1
Royse Ralph L               1
Name: count, dtype: int64
```

There are 7587 makes in the dataset.
The top 5 aircraft makes with the highest number of events are; Cessna (27,146), Piper (14,869), Beech (5,372), Boeing (2,745) and Bell (2,722).
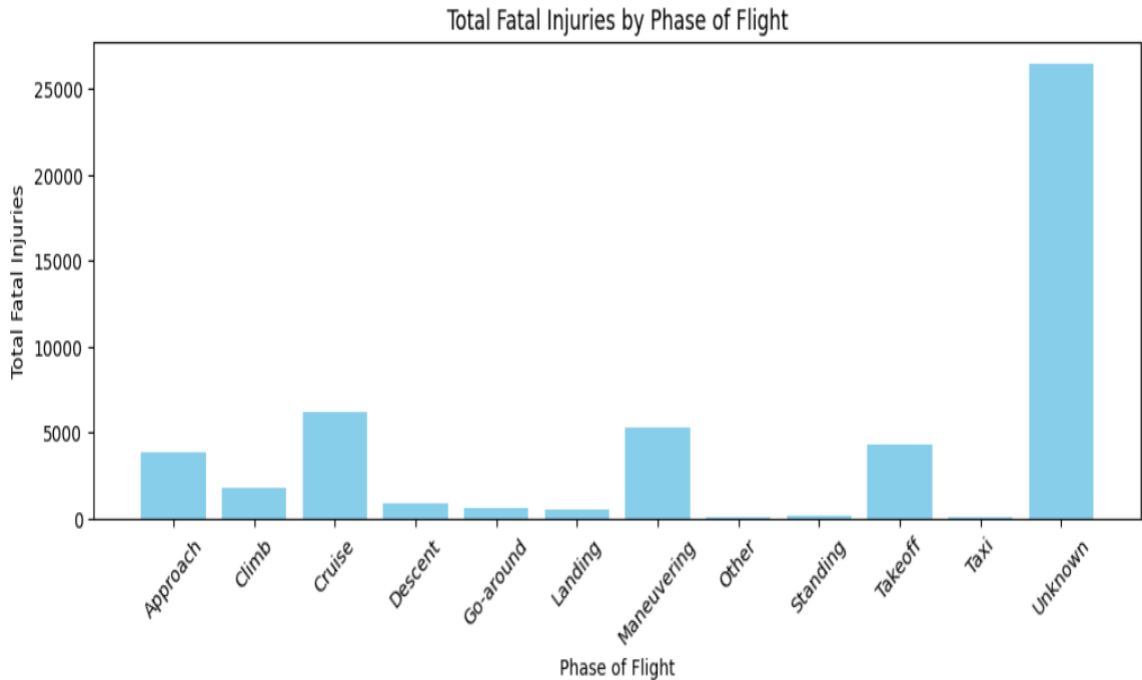**This may mean that these makes are either:**
- a preferred model in the industry and/or;
- most prone to experiencing aviation incidents and accidents.

Royse Ralph L, Izatt, Lutes, Kitchens and Cohen had one incident/accident each.
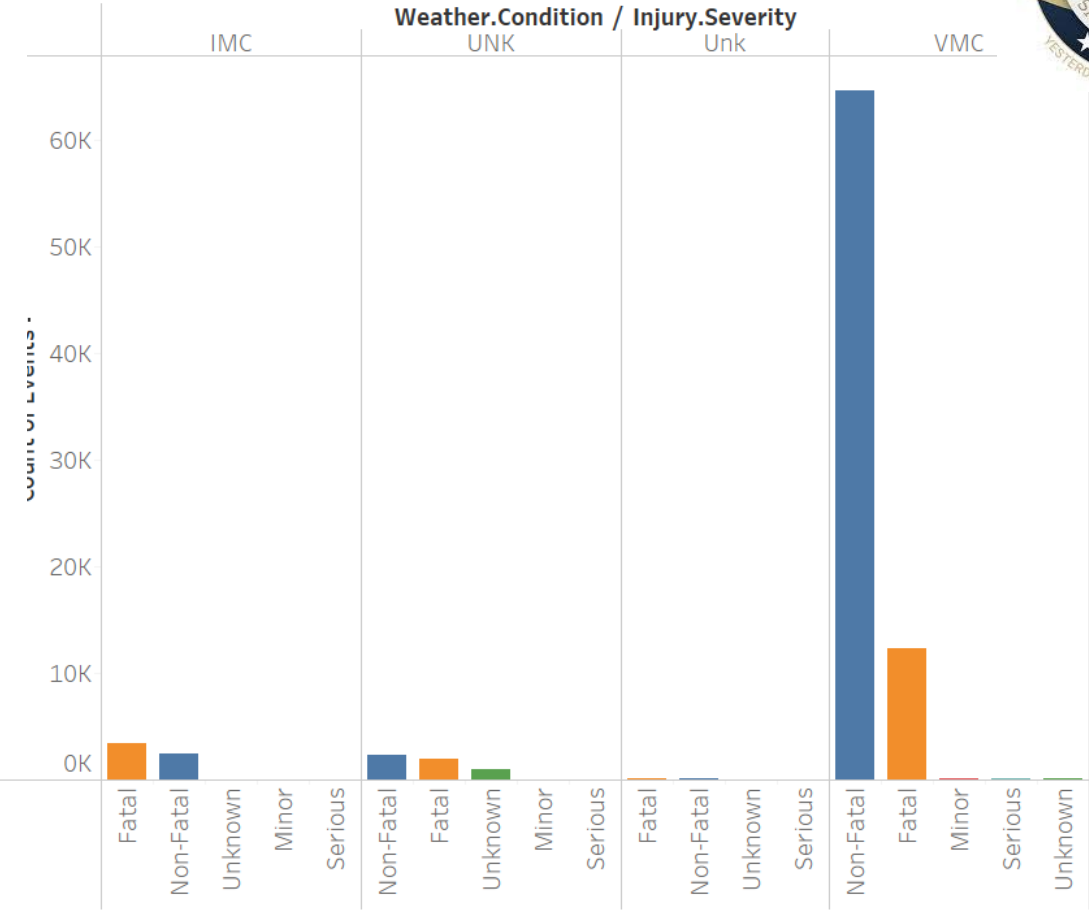
Findings – Factors associated with events

Total Fatal Injuries by Phase of Flight

Events by Weather condition

Many fatalities occured during Cruise, Maneuvering (turning, climbing, or descending close to the ground), Takeoff and Approach

Most of the accidents that happened during Instrumental meteorological conditions (IMC) were fatal due to poor visibility compared to those during Visual meteorological conditions where visibility is good.

Findings – Trends over Time

Events by Year
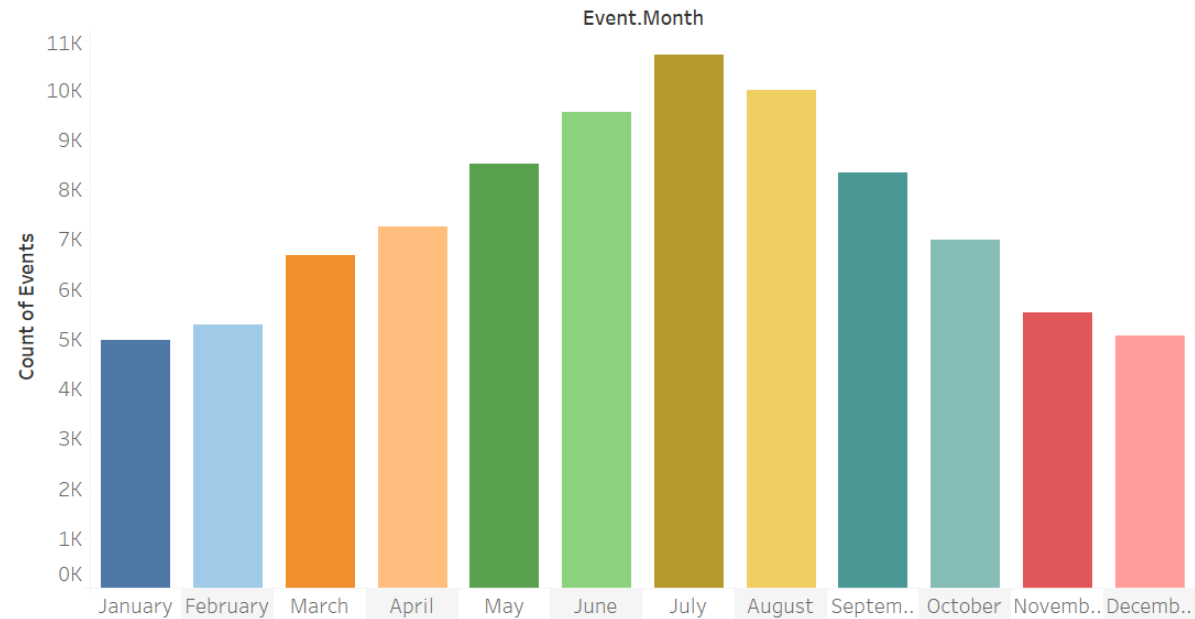
The distribution of events by Months indicates that most events happened from **May to September** as most people tend to fly during Summer while there were few events observed from **November to February** which is associated with the fact that people do not travel during winter
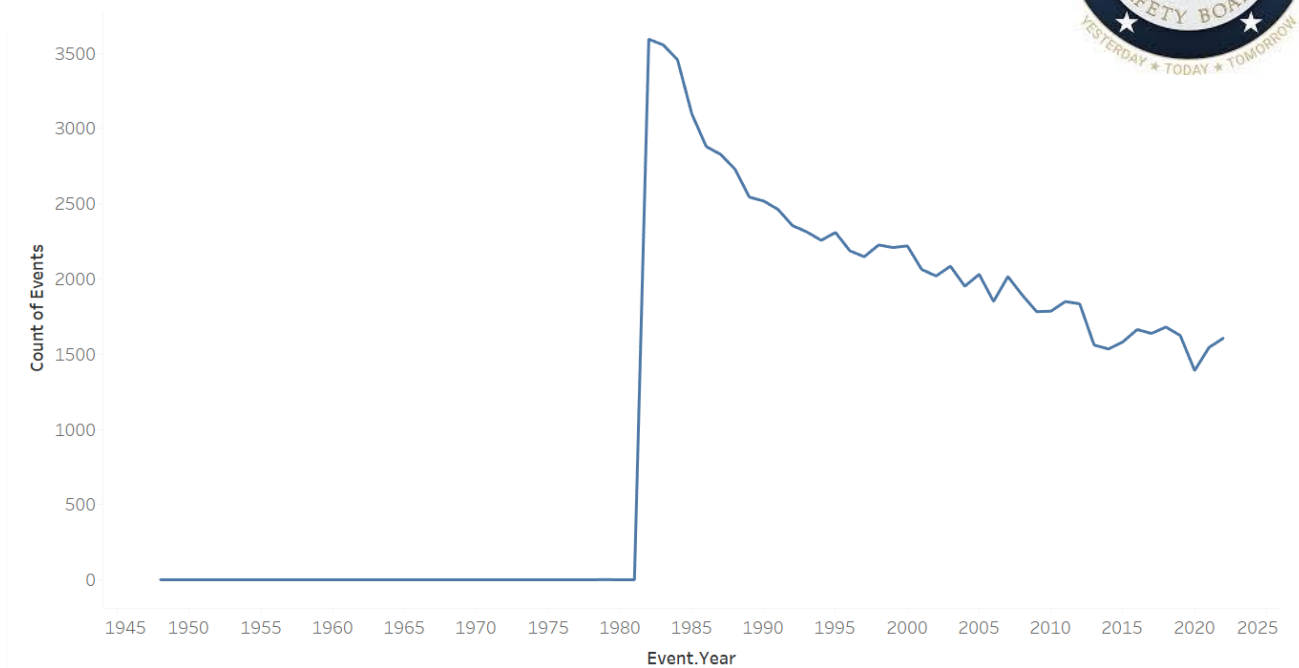
The year 1982 recorded the highest number of events while 2020 had the least.
The declining count of events may point to increased safety measures in the aviation industry.
The COVID-19 pandemic in 2020 may have caused lesser air travel, hence, the low number of accidents and incidents.

Conclusion and Recommendations

➢Key factors associated with a high number of accidents include; phase of flight and weather conditions among others

➢The top 5 aircraft makes with the highest number of events are; Cessna (27,146), Piper (14,869), Beech (5,372), Boeing (2,745), and Bell (2,722). Need to factor in this when considering the planes to buy

➢The declining count of events may point to increased safety measures in the aviation industry. Need to invest in continuous capacity building of personnel and availability of infrastructure for increased safety measures

Thank you!

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