



# Aviation Business Venture Analysis

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# Project Overview

This project analysis aims to provide valuable insights to the company in its interest in Aviation venture. The primary goal is to assist the company's new aviation division in making data-driven decisions when selecting aircraft for commercial and private operations. With a focus on minimizing risks and enhancing operational safety for both commercial and private aviation. The aviation industry presents a highly promising opportunity for our company to diversify its portfolio, particularly as air travel demand continues to grow globally



# Business Understanding

The company is expanding into the aviation industry with the goal of making informed, data-driven decisions regarding the purchase and operation of aircraft for both commercial and private use.

The Head of the Aviation Division is the key stakeholder, responsible for selecting aircraft models that align with the company's safety and operational standards.

To support this decision-making process, the project aims to answer critical business questions such as identifying aircraft makes and models with the lowest risk of accidents, understanding the factors that contribute to aviation incidents, and analyzing historical trends in accident frequency. By addressing these questions, the company will be better equipped to mitigate risks, optimize safety measures, and ensure a successful venture into the aviation industry.



# Data Understanding

## Source of data

The dataset for this analysis comes from the National Transportation Safety Board (NTSB) and contains information on aviation accidents and selected incidents involving civil aviation in the United States and international waters. The data spans from 1948 to 2022 and includes various details related to accident occurrences, the purpose of the flight, the aircraft involved, and weather conditions at the time of the incidents.

## Description of Data

The dataset contains 90,348 records with 31 columns, covering various aspects of aviation accidents, including:

- **Event Date:** The date when the aviation accident or incident occurred.
- **Location:** The geographic location where the incident took place.
- **Aircraft Make and Model:** The manufacturer and specific model of the aircraft involved in the accident.
- **Weather Conditions:** Information on the weather conditions at the time of the incident.
- **Purpose of flight** (e.g., personal, instructional, business)

# Data Cleaning

To address missing values and duplicates in the dataset, I applied different strategies based on the type of data.

- For duplicate rows I dropped duplicate rows and dropped columns with a high percentage of missing values or those deemed irrelevant to the analysis, ensuring the data is clean and focused on key variables.
- For categorical data, I chose to drop rows with missing values.
- For continuous data, I imputed the missing values using the median, as it provides a more typical measure of central tendency and is less sensitive to extreme values or outliers compared to the mean.

This approach ensured that the dataset remained robust and reliable for subsequent analysis, without introducing bias from missing data.





# Data Analysis

## Notorious Makes and Models based on Accidents

| Model     | Make        |      |        |        |         |          |       |           |    |  |
|-----------|-------------|------|--------|--------|---------|----------|-------|-----------|----|--|
|           | Air Tract.. | Bell | Boeing | Cessna | Grumman | Grumma.. | Piper | Schweizer |    |  |
| 150       |             |      |        | 829    |         |          |       |           |    |  |
| 150L      |             |      |        | 460    |         |          |       |           |    |  |
| 150M      |             |      |        | 585    |         |          |       |           |    |  |
| 152       |             |      |        | 2,366  |         |          |       |           |    |  |
| 172       |             |      |        | 1,753  |         |          |       |           |    |  |
| 172M      |             |      |        | 798    |         |          |       |           |    |  |
| 172N      |             |      |        | 1,163  |         |          |       |           |    |  |
| 172P      |             |      |        | 689    |         |          |       |           |    |  |
| 180       |             |      |        | 621    |         |          | 1     |           |    |  |
| 182       |             |      |        | 659    |         |          |       |           |    |  |
| 206B      |             | 516  |        | 2      |         |          |       |           |    |  |
| 737       |             |      | 489    |        |         |          |       |           |    |  |
| G-164A    | 1           |      |        |        | 365     | 1        |       |           | 25 |  |
| PA-18     |             |      |        |        |         |          | 578   |           |    |  |
| PA-18-150 |             |      |        |        |         |          | 571   |           |    |  |
| PA-28-140 |             |      |        |        |         |          | 932   |           |    |  |
| PA-28-161 |             |      |        |        |         |          | 565   |           |    |  |
| PA-28-180 |             |      |        |        |         |          | 572   |           |    |  |
| PA-28-181 |             |      |        |        |         |          | 529   |           |    |  |
| PA-38-112 |             |      |        |        |         |          | 468   |           |    |  |

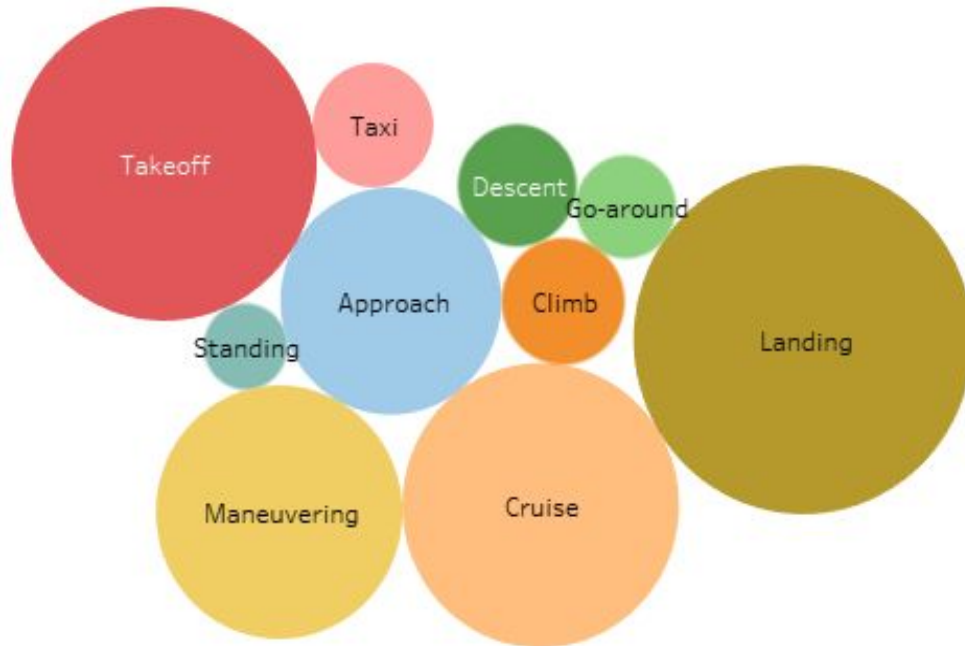
From the table plot Looking at the make and Models Cessna and Piper Makes have high frequencies of accidents this could be due to malfunctions of the airplanes. Hence the Company should avoid purchasing this Makes and go for makes and Models with low accident levels, such as Air Tractor, Bell, and Grumman American.





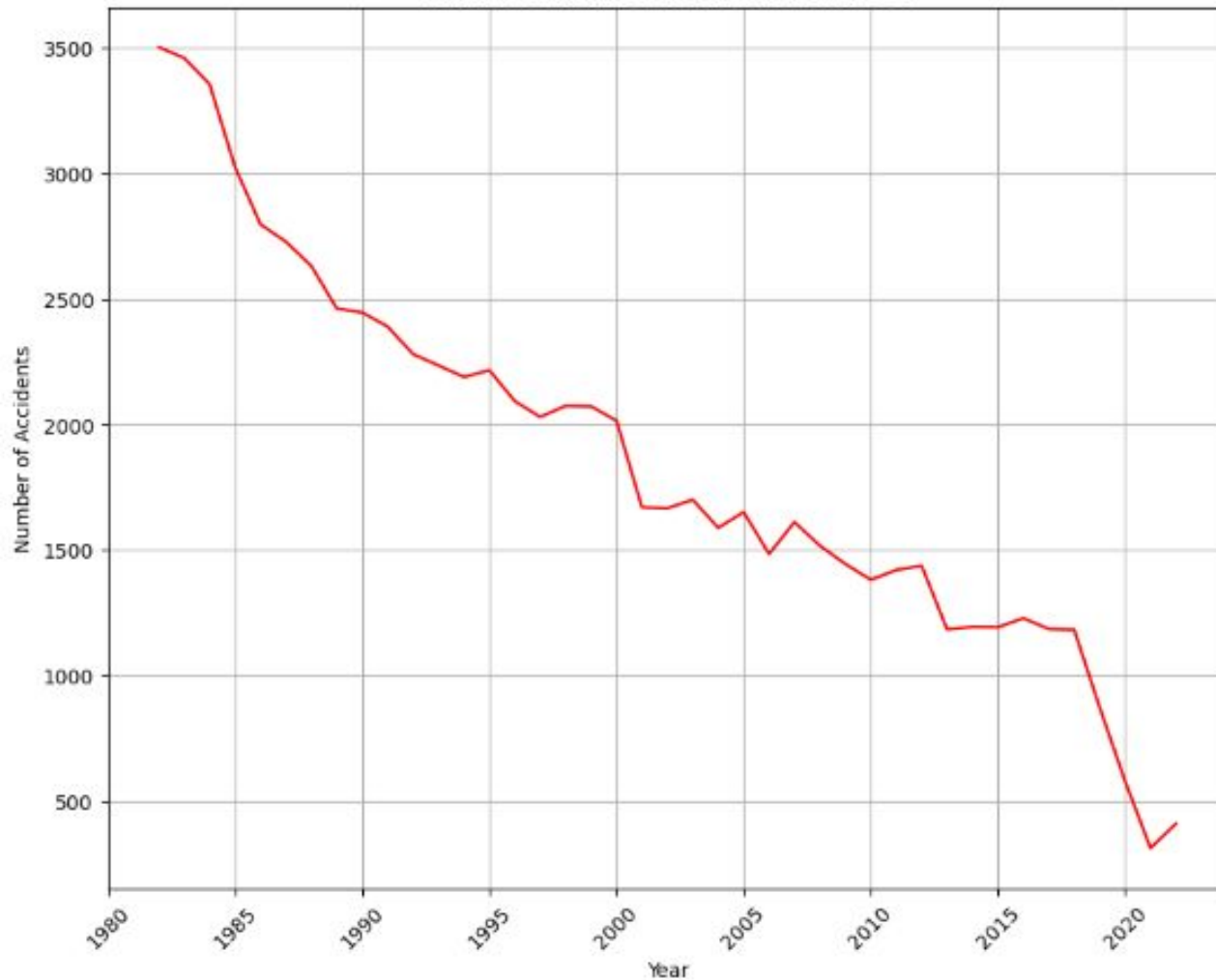
# Data Analysis

## Proportion of Fatalities by Phase of Flight



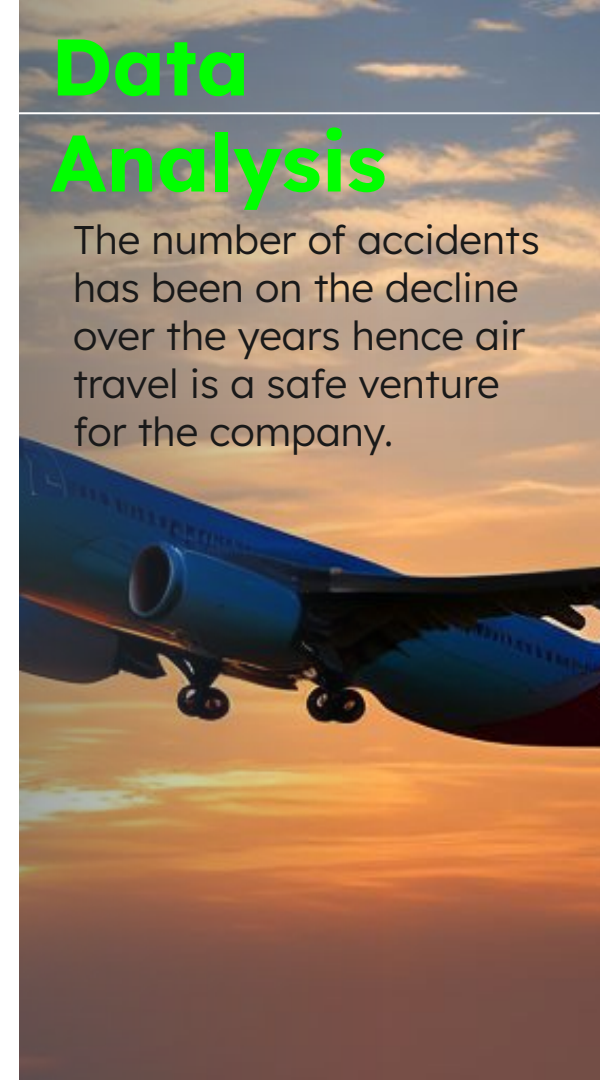
From the bubble plot most of accidents leading to fatalities occur during takeoff, landing, cruise, maneuvering, and approach. This will necessitate continuous training of pilots to ensure safety of the airplanes thus avoiding accidents.

Number of Aviation Accidents From 1980



# Data Analysis

The number of accidents has been on the decline over the years hence air travel is a safe venture for the company.

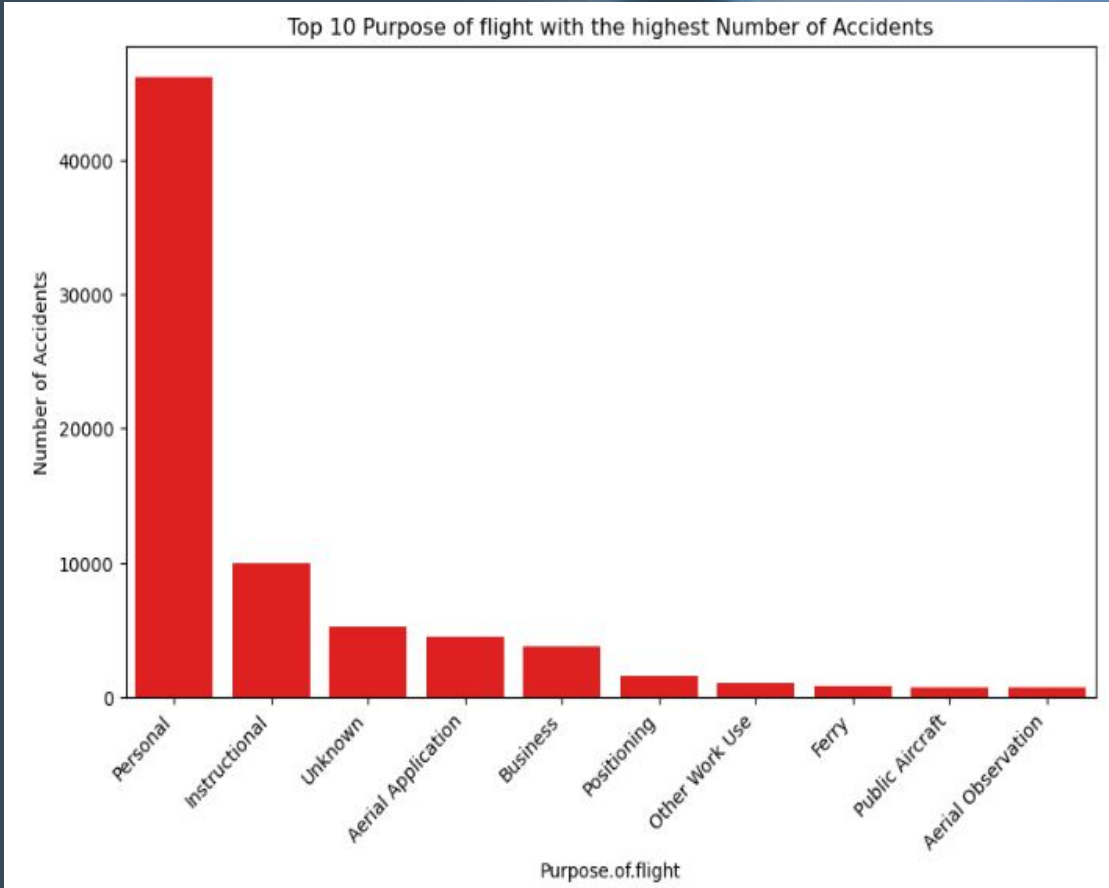




# Data Analysis

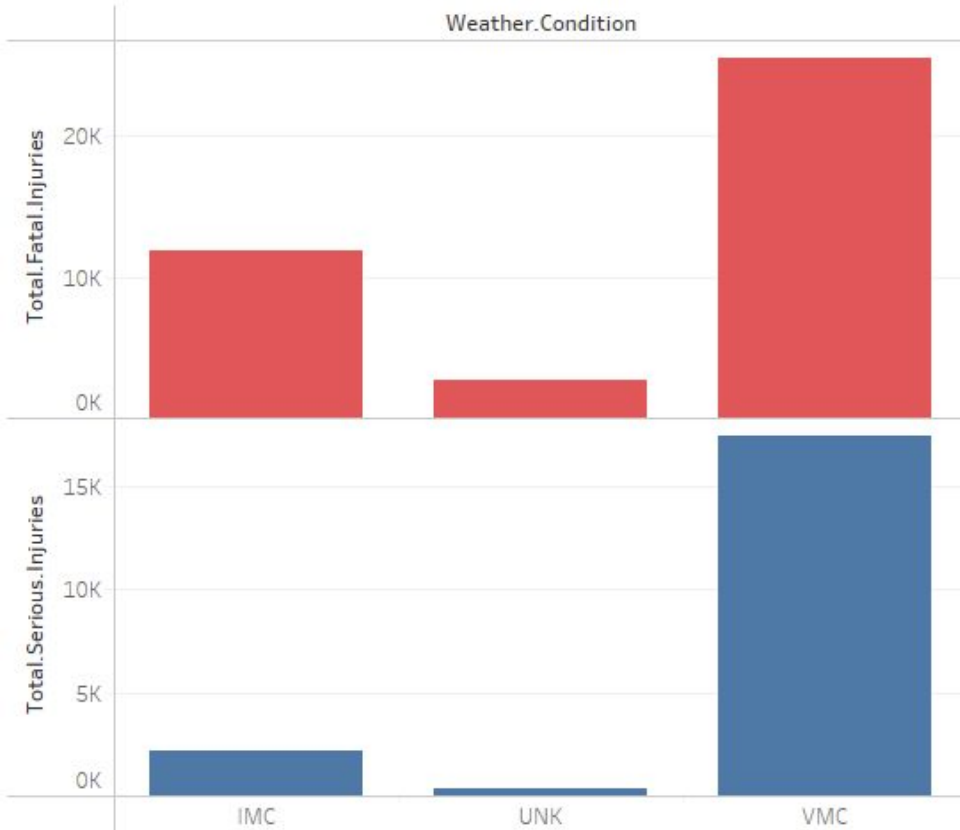
The bar graph shows that Personal, Instructional, and Unknown are the leading causes of accidents.

Thus, the company must restrict its airplane offering and opt for business, positioning, Ferry, Public Aircraft, and Aerial Observation flights with minimal accidents.



# Data Analysis

Weather Conditions and the Number of Fatal and Serious Injuries



VMC: This is when the weather is clear, and pilots can fly by sight.

- From the Weather Condition bar plot, it is evident that Pilots cause accidents under clear conditions when the visibility is very clear.
- This necessitates adequate and continuous training of the pilots.

# Recommendations

In conclusion the findings reveal that accidents leading to fatalities are most frequent during critical flight phases, such as takeoff, landing, and approach. Continuous and enhanced pilot training will be essential to mitigate these risks. Furthermore, aircraft involved in personal and instructional flights are more prone to accidents, suggesting the company should prioritize business, ferry, and aerial observation flights, which have lower accident rates.

The analysis also highlighted specific aircraft makes and models, such as Cessna and Piper, which have higher accident frequencies, possibly due to mechanical issues. The company should avoid these makes and instead focus on safer alternatives like Air Tractor, Bell, and Grumman American.

Lastly, the trend of declining accidents over the years, along with the safe nature of air travel, presents a promising opportunity for the company to expand into the aviation industry. By focusing on safer aircraft models, implementing rigorous training programs, and targeting low-risk flight operations, the company can successfully minimize risks and thrive in this new venture.



# Next Step

An in-depth analysis is essential for evaluating potential aircraft for acquisition. By examining factors such as fuel efficiency, operational lifespan, maintenance costs, and safety records, we can make well-informed decisions about which aircraft will provide the best long-term value for the company. This comprehensive approach ensures that the selected fleet will optimize both operational safety and cost-effectiveness, aligning with the company's strategic goals in the aviation industry.



# Thank you

## QUESTIONS

Feel free to reach out with any questions.

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