# RISK ASSESSMENT FOR AIRCRAFT PURCHASE

## Overview

As our company explores new opportunities in the aviation industry, it's crucial to understand the risks associated with different aircraft. This project will use data science techniques to analyze factors like accident history, maintenance costs, and operational efficiency to provide clear, actionable insights and identify the safest options for the company to start this new business endeavor.

# Business Understanding

Our company is expanding in to new industries to diversify its portfolio. Specifically, the company is interested in purchasing and operating airplanes for commercial and private enterprises, but do not know anything about the potential risks of aircraft. This project aims to determine which aircraft are the lowest risk for the company to start this new business endeavor.

The key business questions are:

➡ 1. How do different phases of flight impact the risk levels of aircraft?

➡ 2. Over the last few decades, how safe is an airplane?

➡ 3. Which airplanes have the highest and lowest accident rates?

➡ 4. What is the correlation between the Number of Engines and Injury count?

➡ 5. Which aircraft Model has the highest accident count?

➡ 6. During which weather conditions did most accidents occur?

# Data Understanding

The dataset used for this analysis is a dataset from the National Transport Safety Board website which is based on records of aviation accidents, which are 88,889 in number and span across 31 columns. Data includes accident dates, locations, injury severity, damage to aircraft, and more.

# Data Analysis

This section will display the results of answering the business questions.

## 1. How do different phases of flight impact the risk levels of aircraft?



Fatal accident during each flight phase
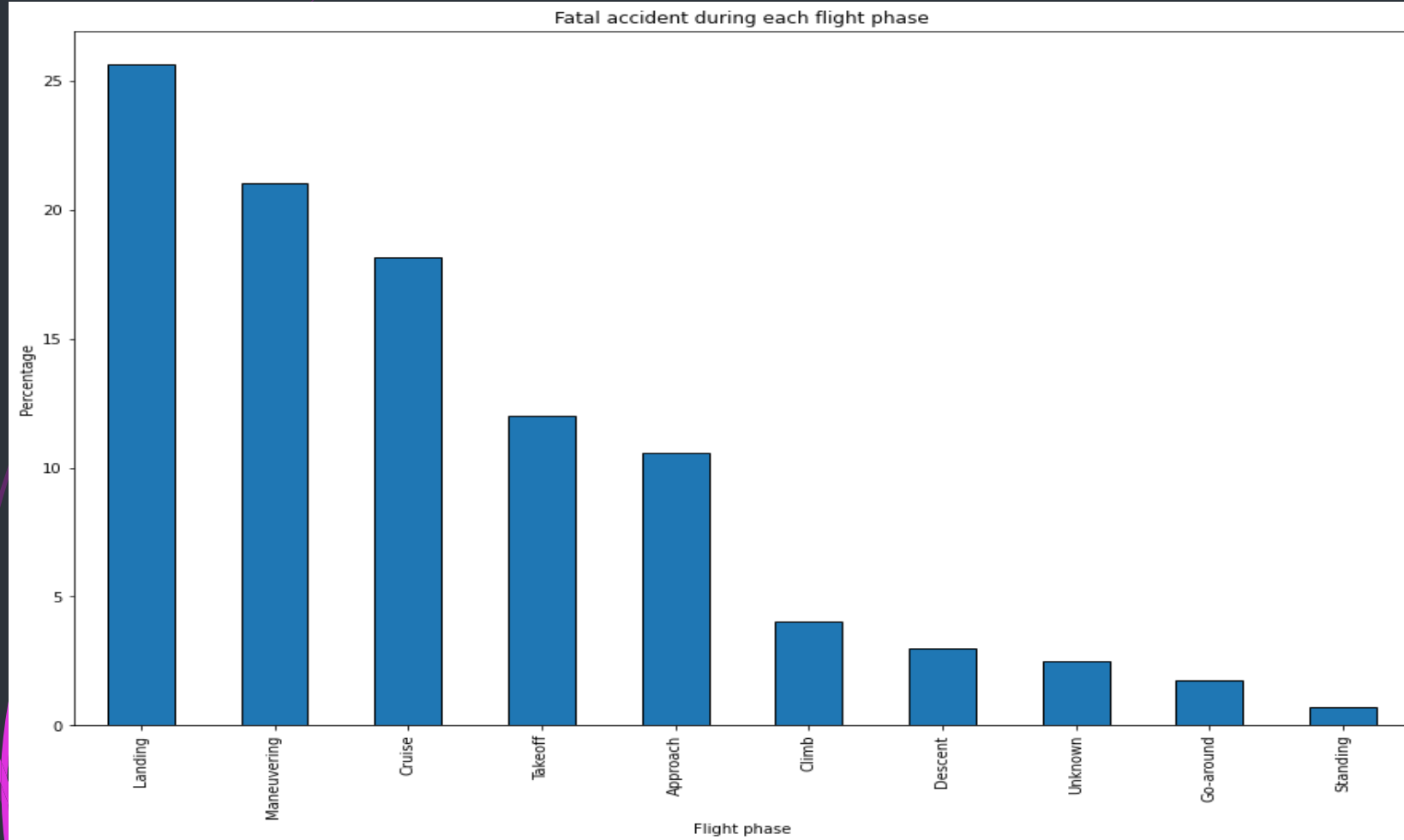
From the adjacent visualization: The most common phase during which fatal accidents occur are during Landing (26%), Maneuvering (21%), cruise (18%), takeoff (12%), and approach (10%). Therefore, `Landing` is the most dangerous flight phase.

# 2. Over the last few decades how safe is an airplane?



Fatal accident historical trend
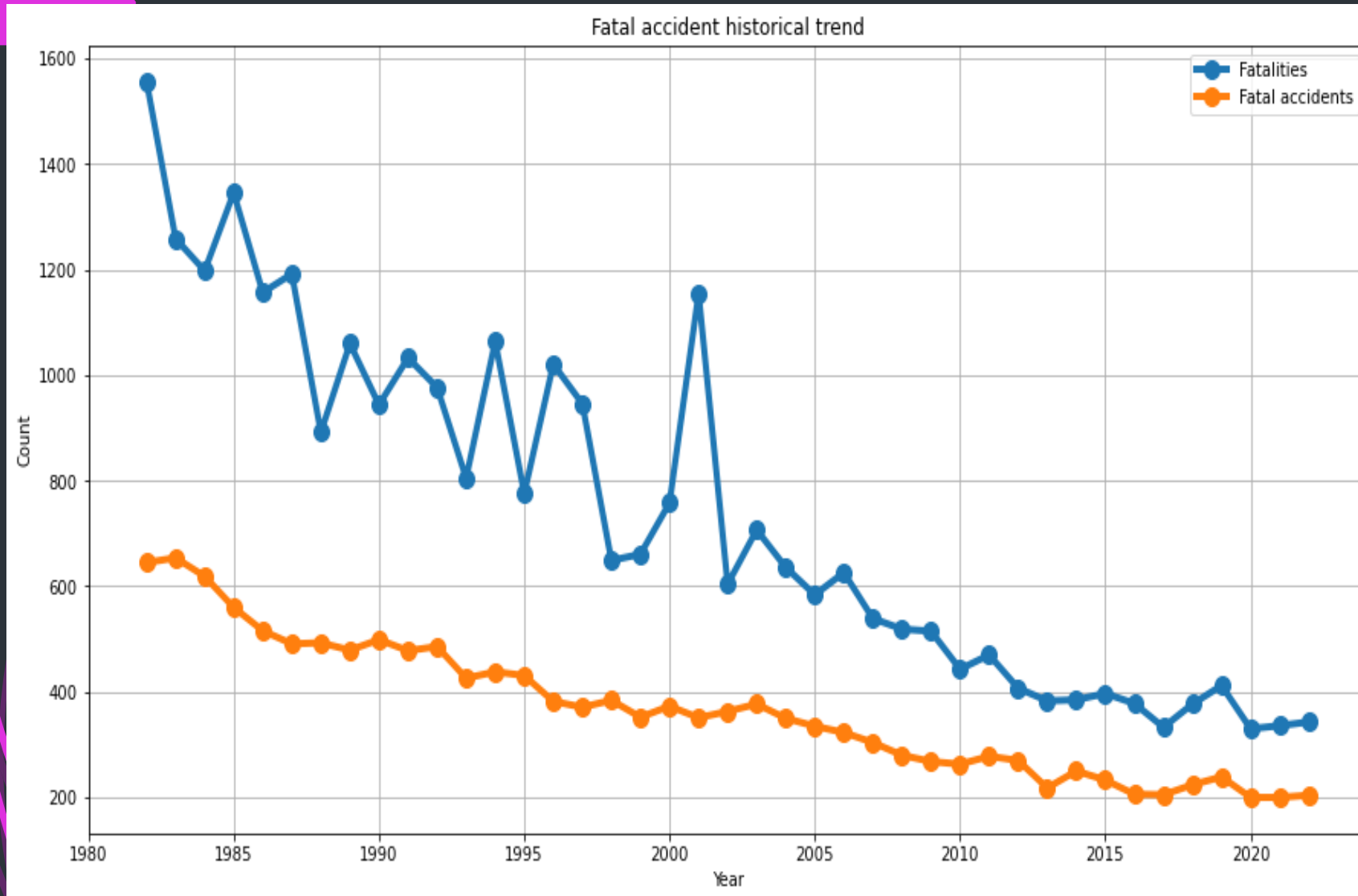
Both the number of fatalities (blue line) and fatal accidents (orange line) have significantly decreased over the last few decades. This suggests a substantial improvement in aviation safety over time.
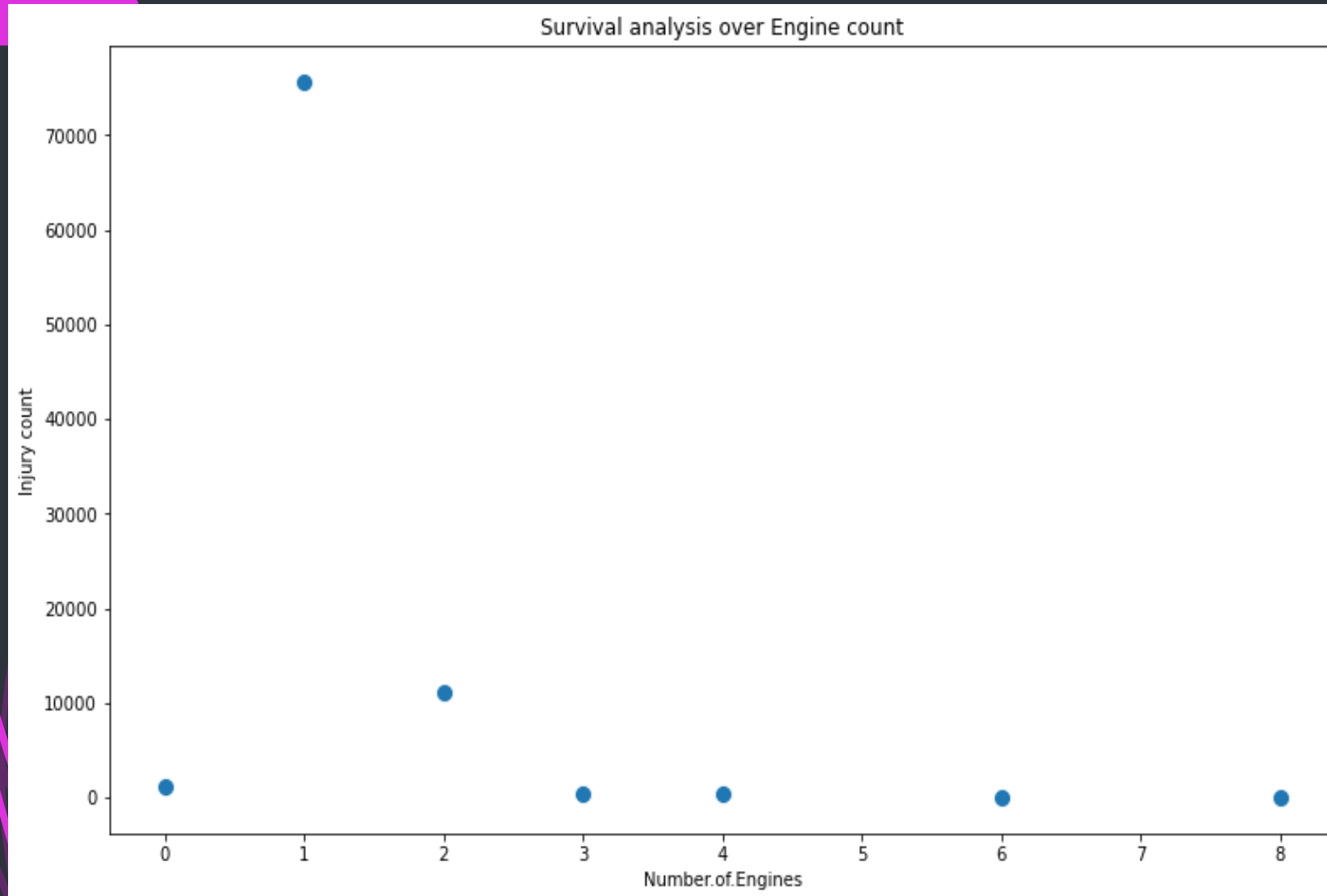
# 3. Which airplane has the highest accident rates?



Fatal accident for each aircraft make
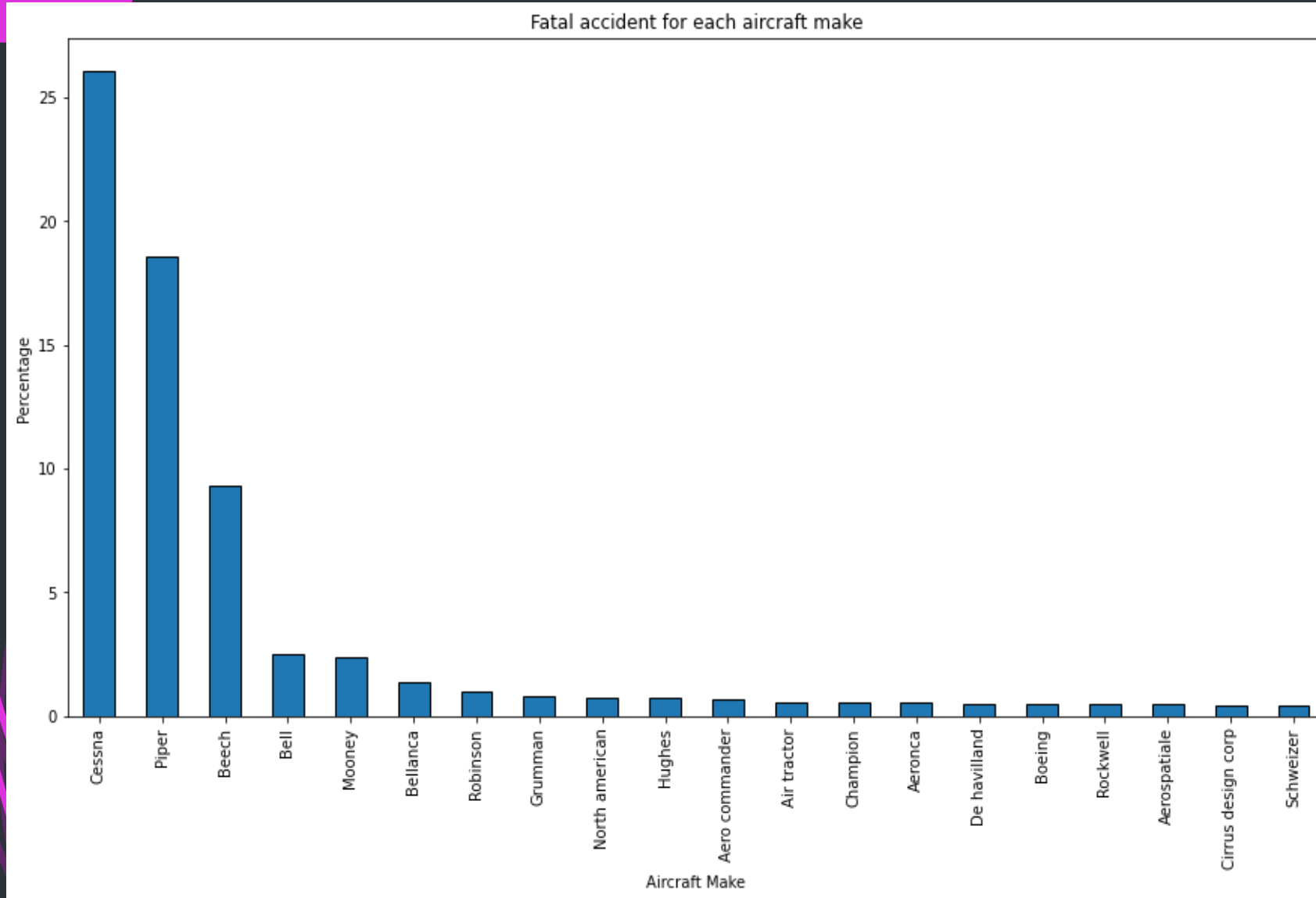
From the visualization:
The Cessna make has the highest accident rate, as indicated by the tallest bar on the graph. This suggests that Cessna aircraft have experienced the most fatal accidents compared to other makes.

# 4. What is the relationship between the Number of Engines and Injury count?



Based on the scatter plot, we note that the Aircraft with fewer engines tend to have higher injury counts, while those with more engines tend to have lower injury counts.

# 5. Which aircraft Model has the highest Accident count?



Model analysis for Accident count
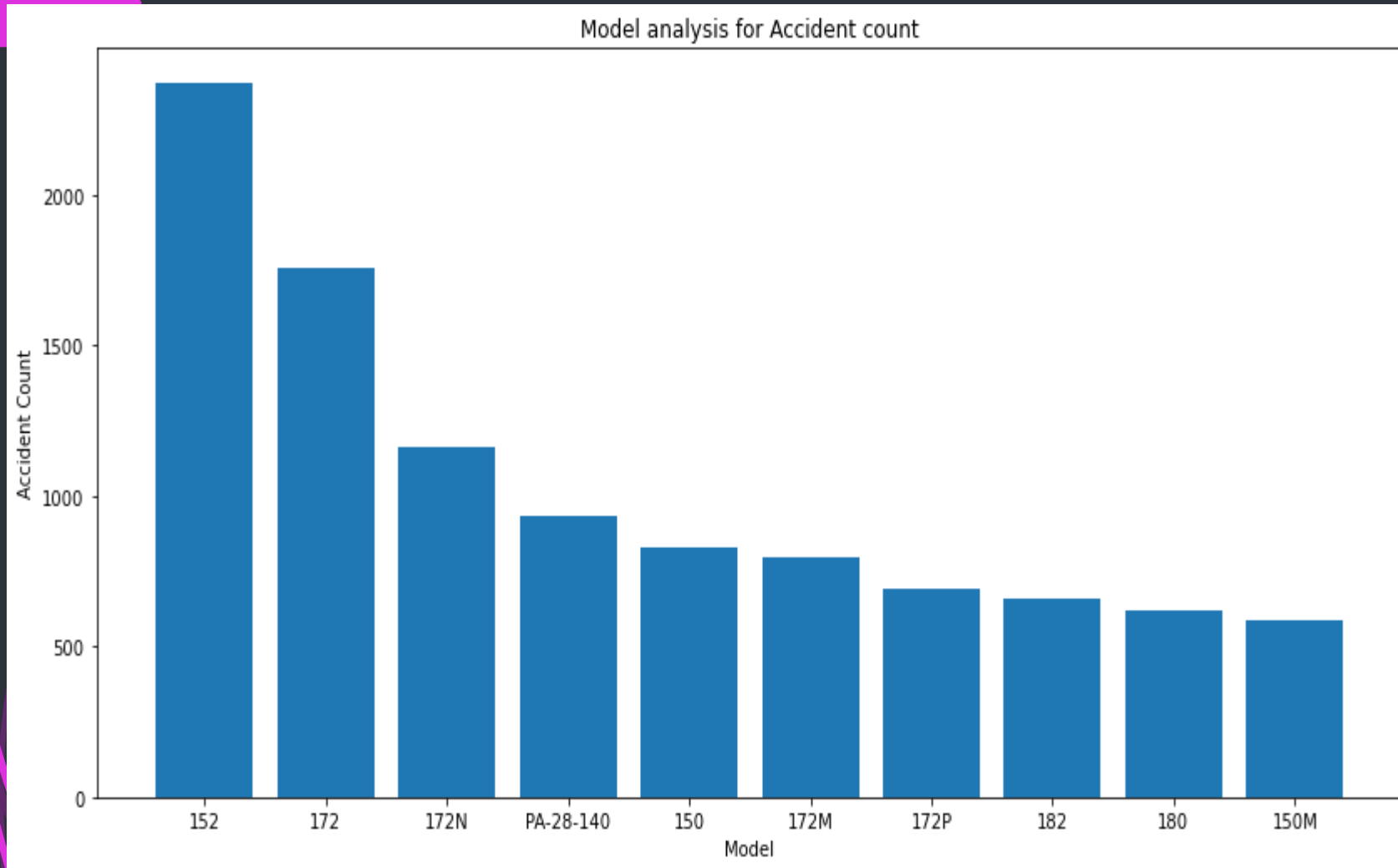
The aircraft model 152 has the highest accident count, with just over 2500 accidents. This is significantly higher than any other model listed on the graph.

# 6. During which weather conditions did most accidents occur?



Weather condition for accident count
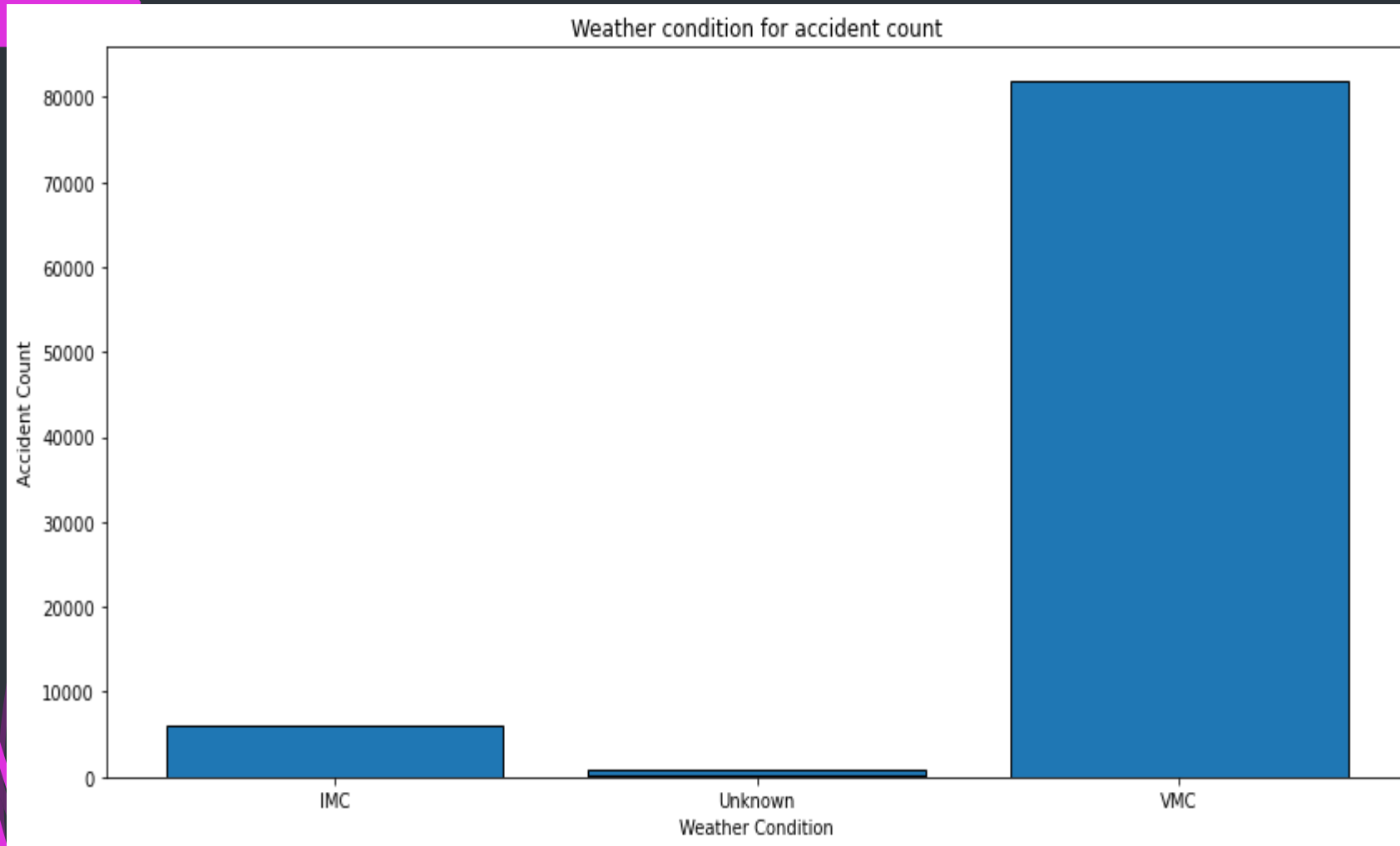
Based on the graph, most accidents occur under Visual Meteorological Conditions (VMC), which might seem counterintuitive as one might expect more accidents in poorer visibility conditions (IMC). This could be due to the higher frequency of flights in VMC compared to IMC.

# Key Findings

This article analyzed aviation safety using NTSB data and the following were the findings drawn from the analysis:

1. The most dangerous flight phases in terms of fatalities are `Landing, maneuvering, cruising, takeoff`, and `approach`.

2. Over the years, the number of fatal aviation incidents and the fatality rate have both decreased, indicating a trend towards safer air travel.

3. `Cessna, Piper,` and `Beech` are the most common general aviation aircraft manufacturers, which also makes them the models most frequently involved in fatal accidents.

4. Aircraft with fewer engines tend to have higher injury counts, while those with more engines tend to have lower injury counts.

5. The aircraft model `152` has the highest accident count, making it the model most frequently involved in accidents among those listed.

6. Most accidents occur under Visual Meteorological Conditions (VMC). This could be due to the higher frequency of flights in VMC compared to other weather conditions.

# Recommendations

Based on the findings, I would recommend the company to:

1. Invest in aircraft equipped with enhanced navigation systems, automated landing technologies, and robust safety protocols for takeoff and landing.

2. The overall trend towards safer air travel is promising and therefore, continue to prioritize safety by adopting the latest safety standards and technologies.

3. Cessna, Piper, and Beech are the most common manufacturers involved in fatal accidents, therefore, when purchasing new aircraft, first evaluate other manufacturers with strong safety records and comparable performance.

4. Opt for multi-engine aircraft, especially for longer flights or flights over challenging terrain because multi-engine aircraft provide redundancy and can be safer in the event of an engine failure.

5. While the Cessna 152 model is popular for training, consider diversifying the fleet with other models that have better safety records.

6. Implement rigorous training for pilots to handle unexpected situations even in seemingly safe weather conditions. Invest in advanced weather monitoring and predictive technologies to enhance situational awareness.

# *THANK YOU !*

## Do you have any questions?

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