



ANALYSIS OF AVIATION ACCIDENT DATA

INTRODUCTION

This project aims to analyze the Aviation Accident Database & Synopses, up to 2023, to identify the lowest-risk aircraft for a company looking to diversify its portfolio by purchasing and operating airplanes for commercial and private enterprises.

The goal is to provide actionable insights to the head of the new aviation division to inform their decision-making process.



BUSINESS UNDERSTANDING

Main Objective



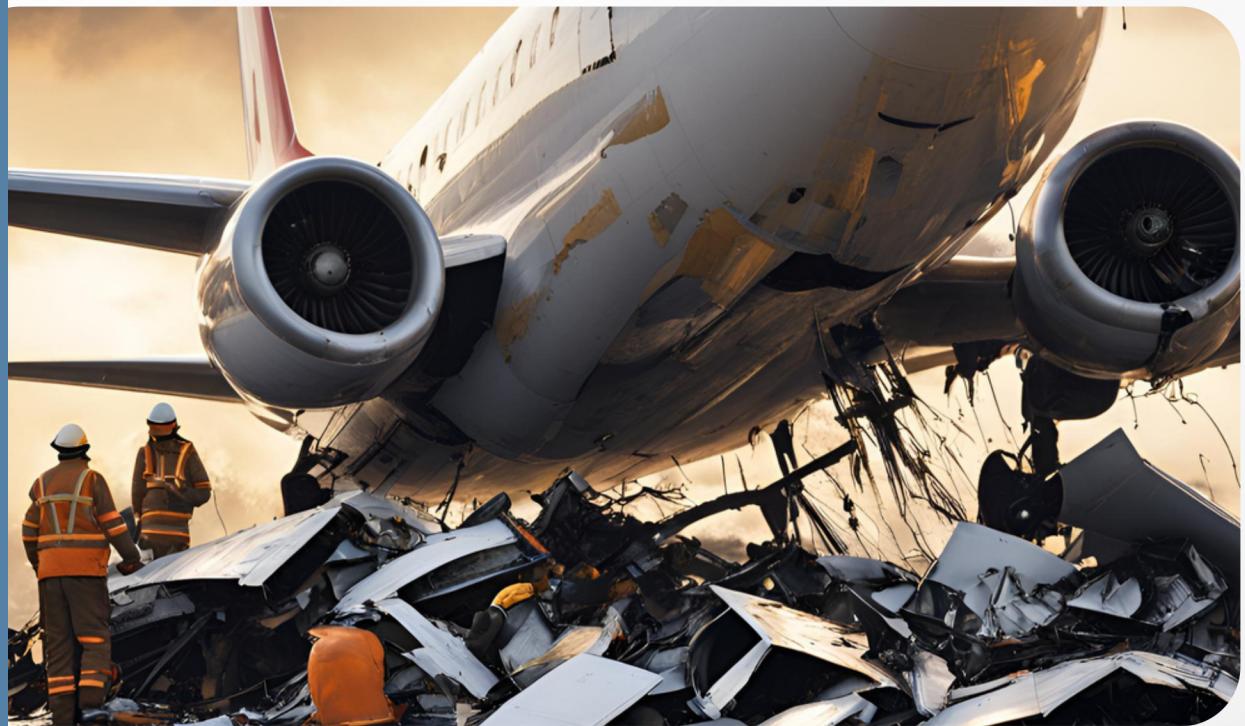
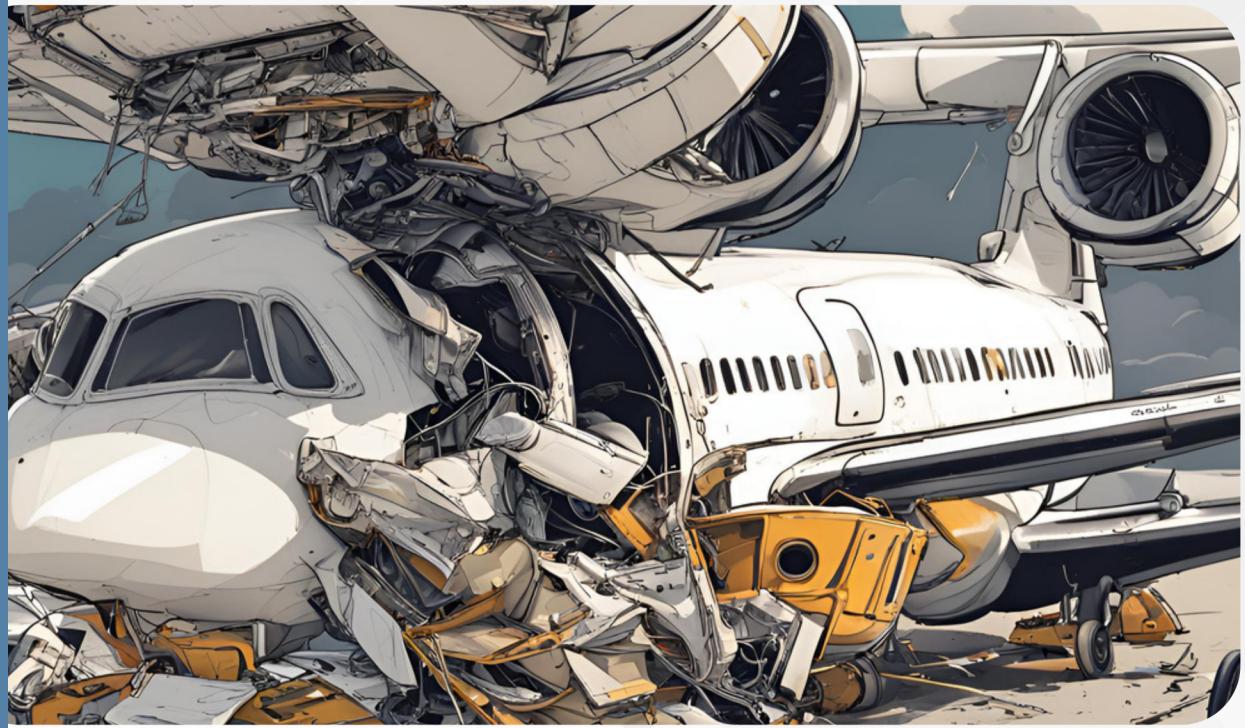
The main objective of this project is to identify the safest aircraft for the company to purchase and operate, thereby minimizing potential risks and ensuring a successful entry into the aviation industry.



DATA UNDERSTANDING

The Aviation Accident Database & Synopses, up to 2023, contains detailed information on aviation accidents and incidents. The dataset includes variables such as:

- Aircraft Type: The type of aircraft involved in the accident.
- Accident Date: The date of the accident.
- Fatalities: The number of fatalities resulting from the accident.
- Injuries: The number of injuries resulting from the accident.



DATA ANALYSIS

Data Cleaning

- The data is meticulously cleaned to guarantee its accuracy and consistency, laying the groundwork for reliable analysis.

Data Analysis

Advanced techniques are employed to unearth trends and patterns in accident rates and fatalities, revealing the relative risk of different aircraft types.



Risk Assessment:

- Based on the analysis, a comprehensive risk assessment quantifies the safety concerns associated with each aircraft type.

Insight Generation:

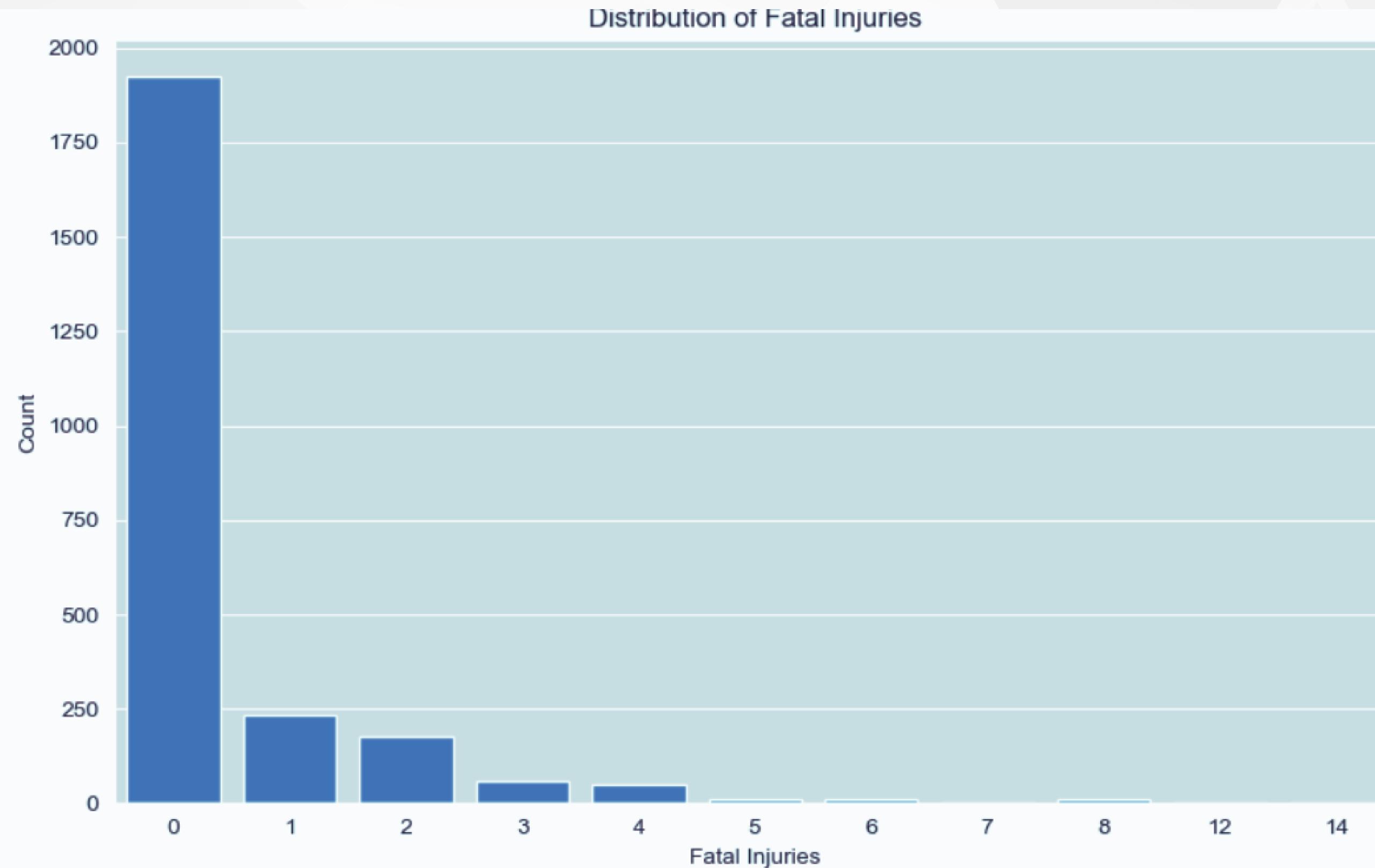
- Actionable insights are generated by translating the data and risk assessment into practical guidance for selecting aircraft that prioritize safety while aligning with business needs.



FINDINGS

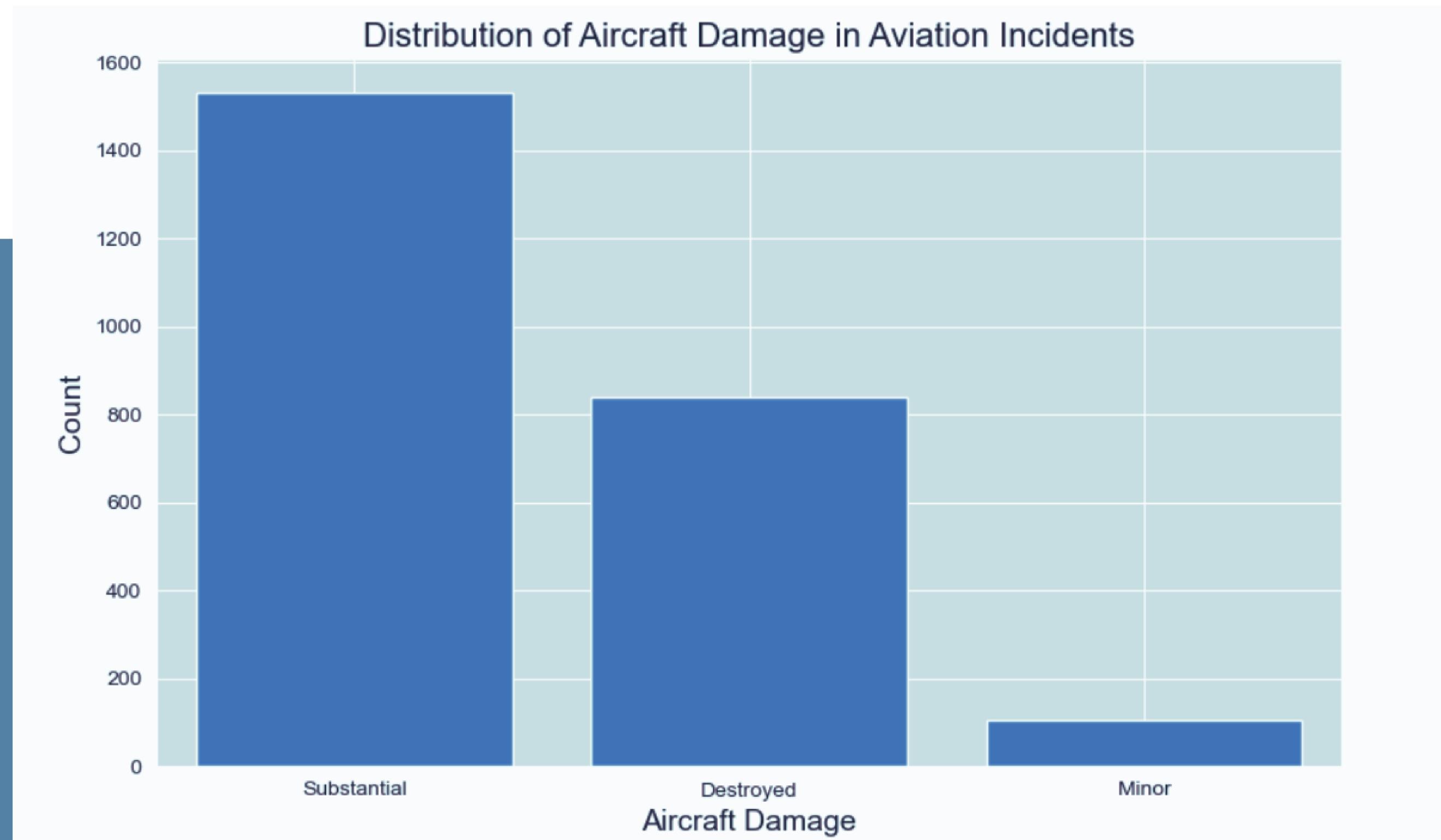
Distribution of Fatal Injuries

From the Plot show most of the accidents that occurred were Non - Fatal.



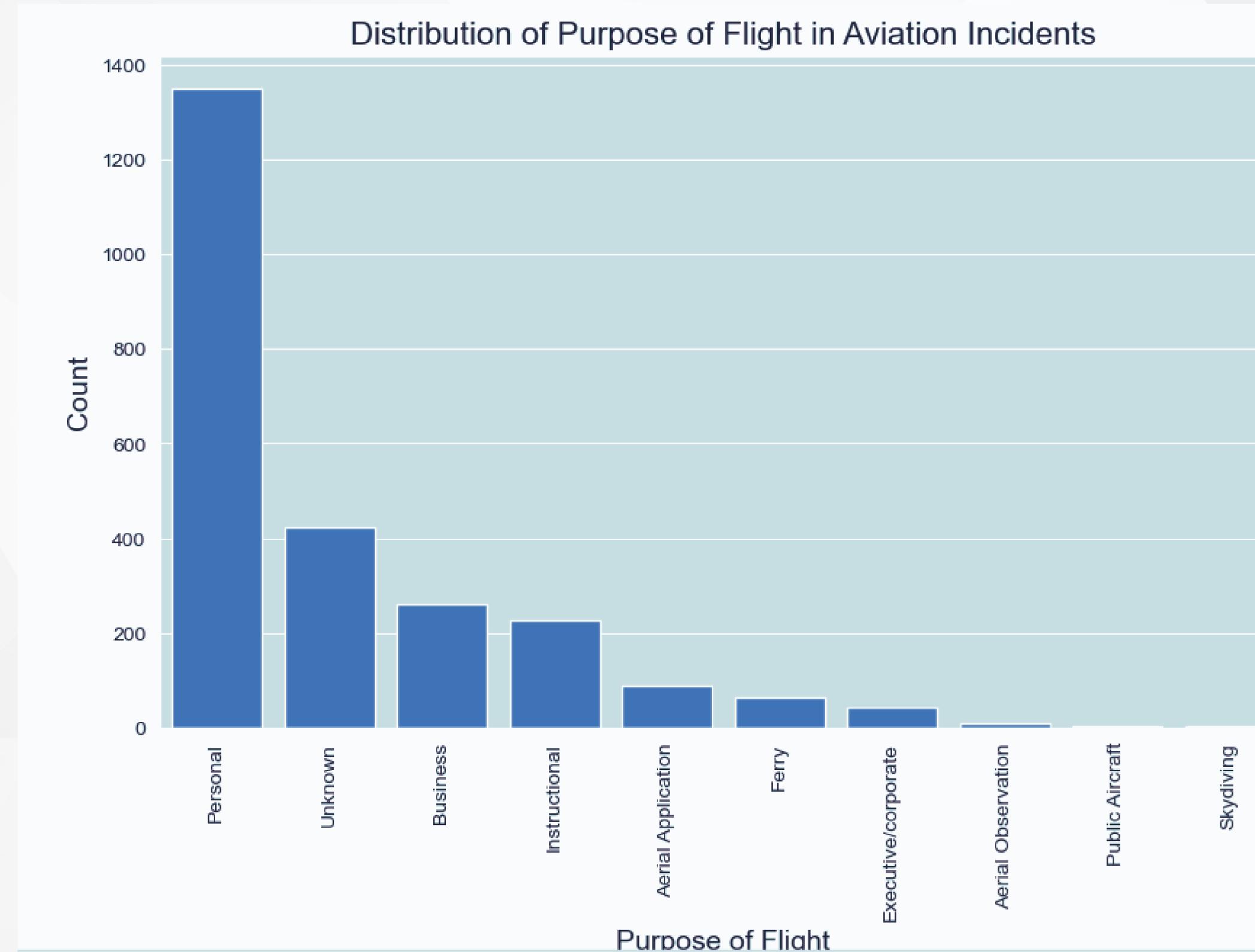
DISTRIBUTION OF AIRCRAFT DAMAGE IN AVIATION INCIDENTS

According to the plot, Airplanes involved in most accidents had substantial damage.



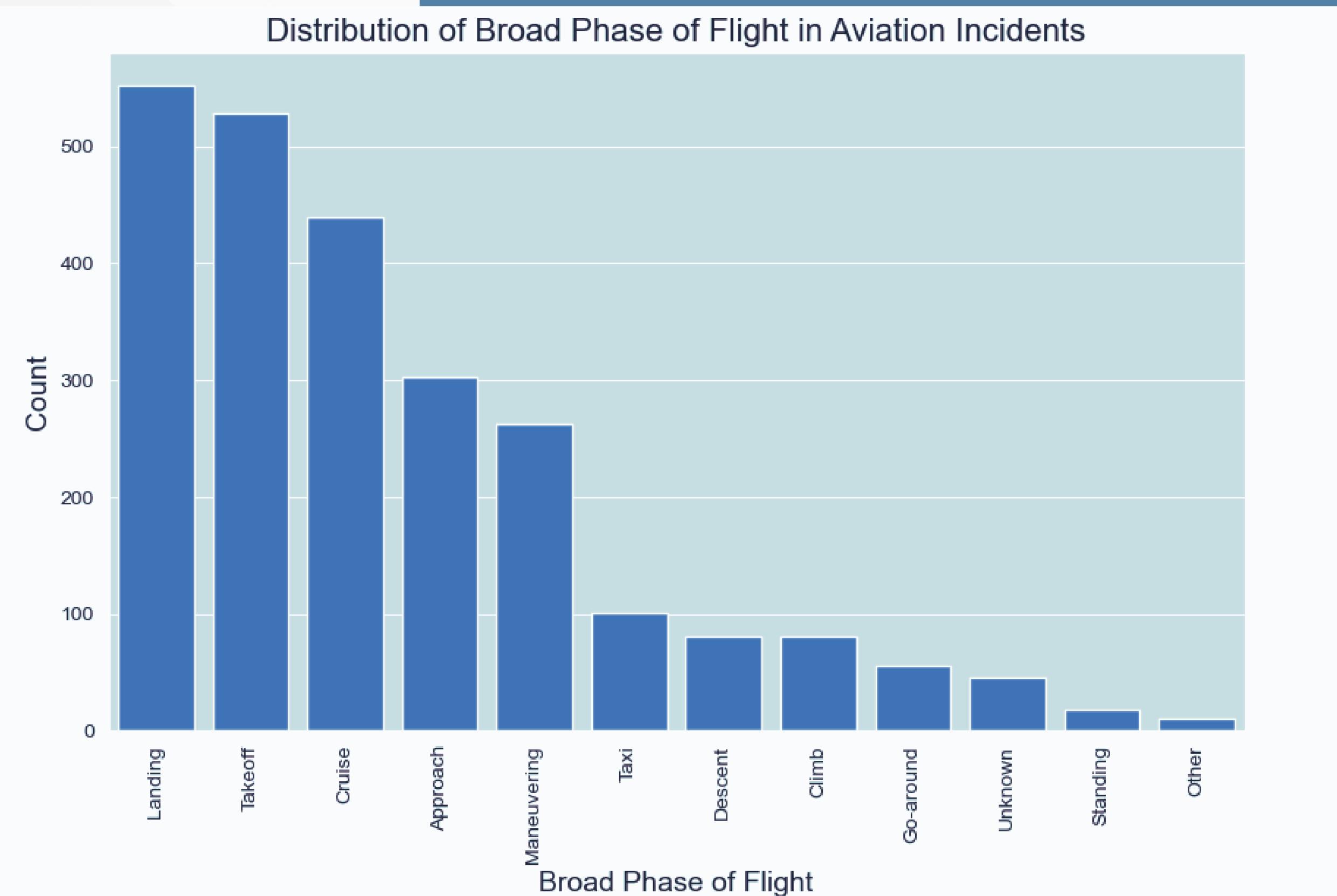
DISTRIBUTION OF PURPOSE OF FLIGHT IN AVIATION INCIDENTS

According to the plot most accidents occurred when the airplanes were used for personal flights.

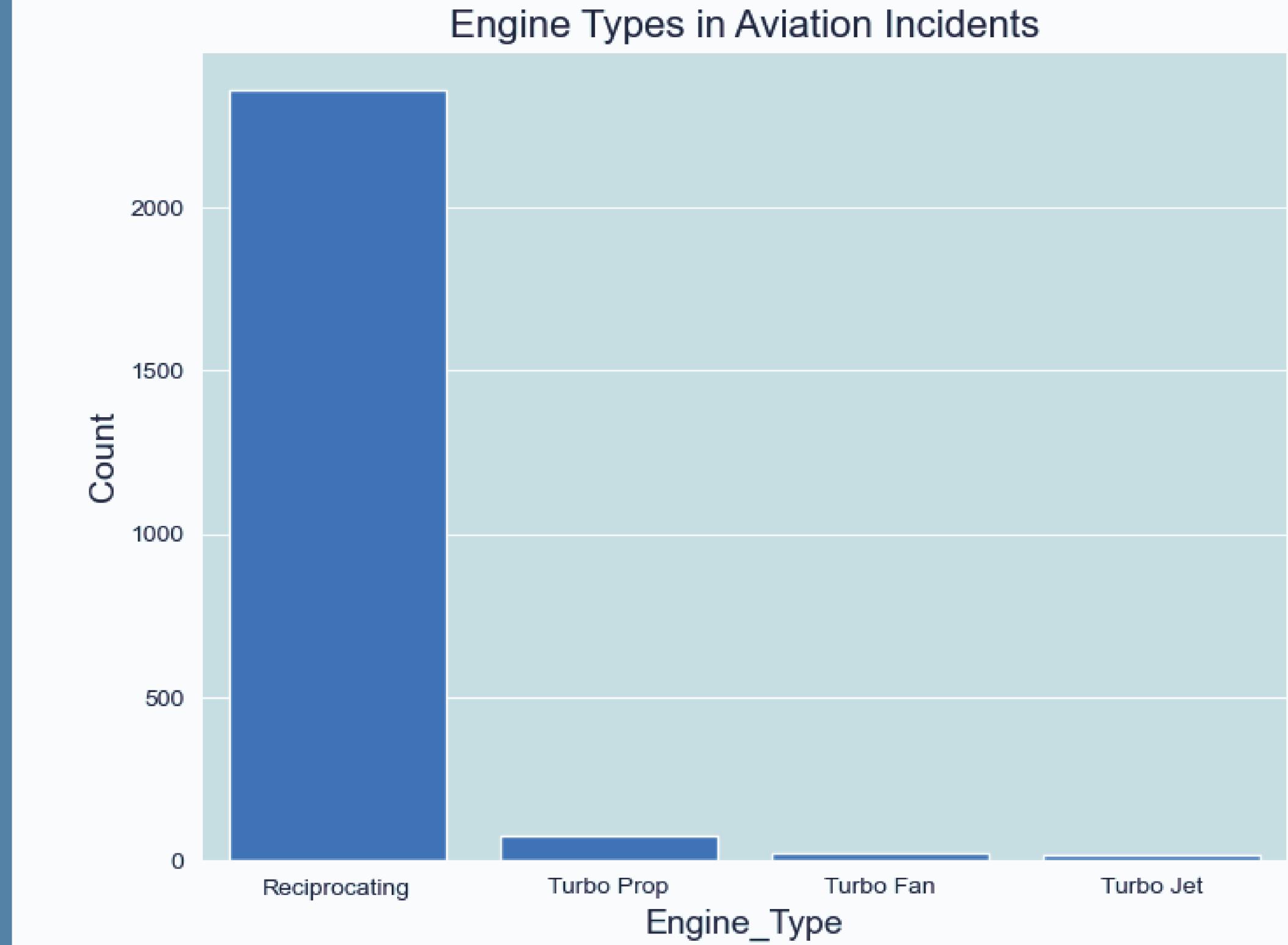


DISTRIBUTION OF BROAD PHASE OF FLIGHT IN AVIATION INCIDENTS

According to the plot,
majority of the
accidents took place
during the take off
stage



DISTRIBUTION OF ENGINE TYPES IN AVIATION INCIDENTS

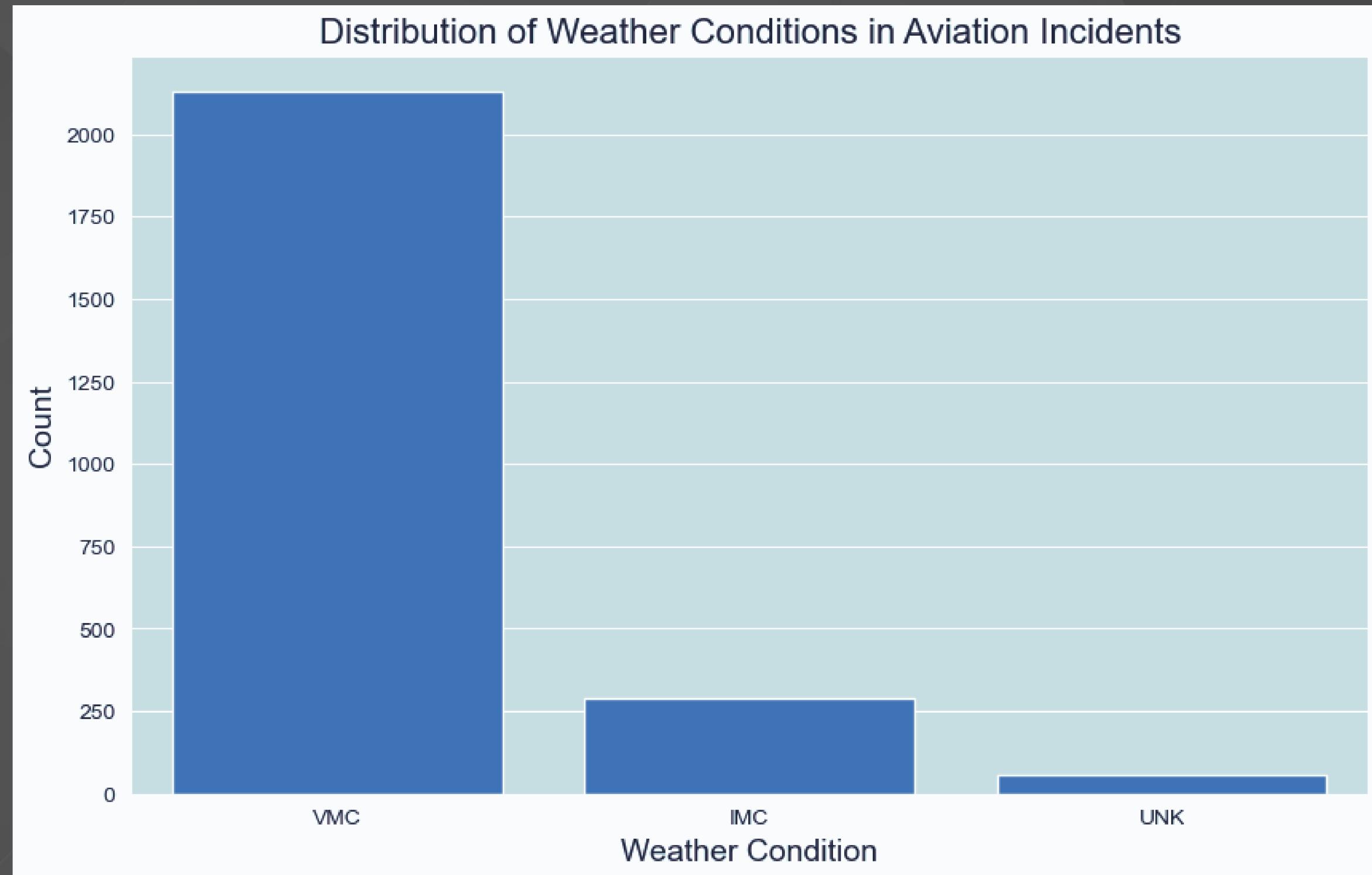


According to the plot, most accidents were recorded when the engine type was Reciprocating. The Turbo jet engines recorded the lowest number of accidents.

Distribution of Weather Conditions

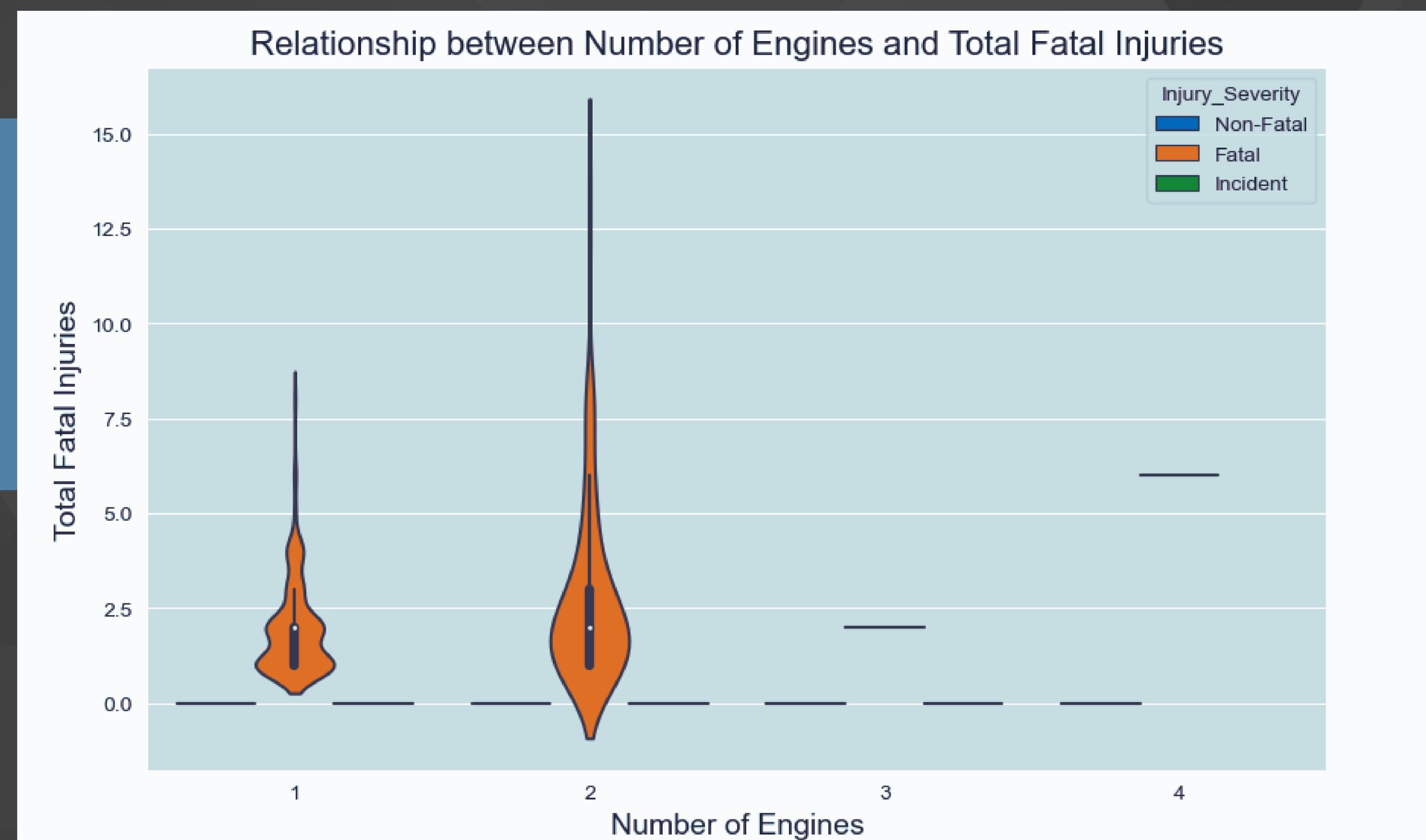
Weather Conditions in Aviation Incidents

According to the plot
majority of the
accidents take place
during the VMC
Weather



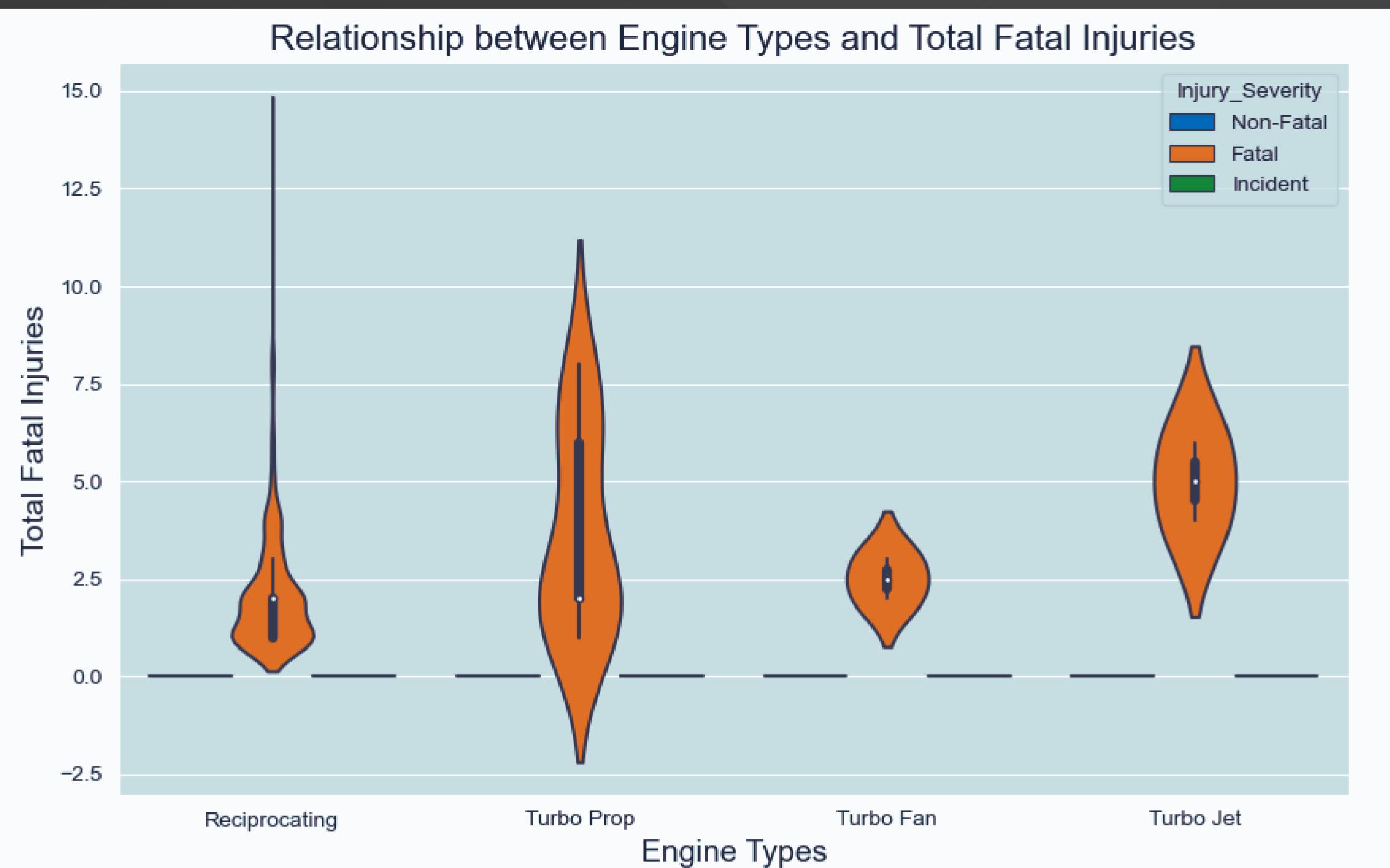
RELATIONSHIP BETWEEN NUMBER OF ENGINES AND TOTAL FATAL INJURIES

The width of each coloured shape indicates the frequency of occurrence, hence airplanes with two engines experienced the most number of fatal injuries.



ENGINE TYPES AND TOTAL FATAL INJURIES

Reciprocating engines record the highest number of fatal injuries while the Turbo Fan engines have the lowest number of Fatal injuries.

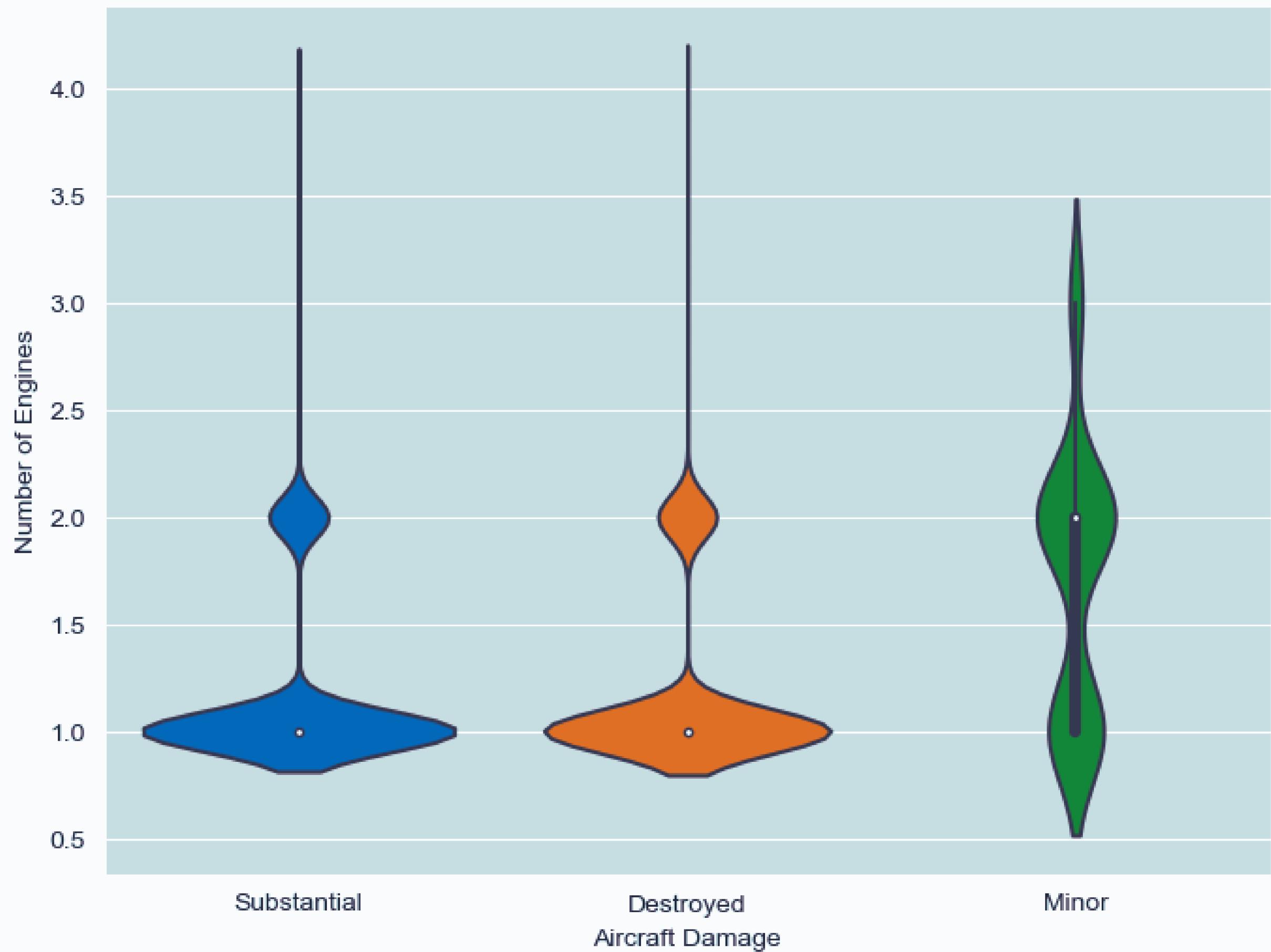


AIRCRAFT DAMAGE VS NUMBER OF ENGINES

From the plot you can see that having airplanes with one or two engines, experience higher severity during accidents as they are associated with destroyed and substantial damage categories.

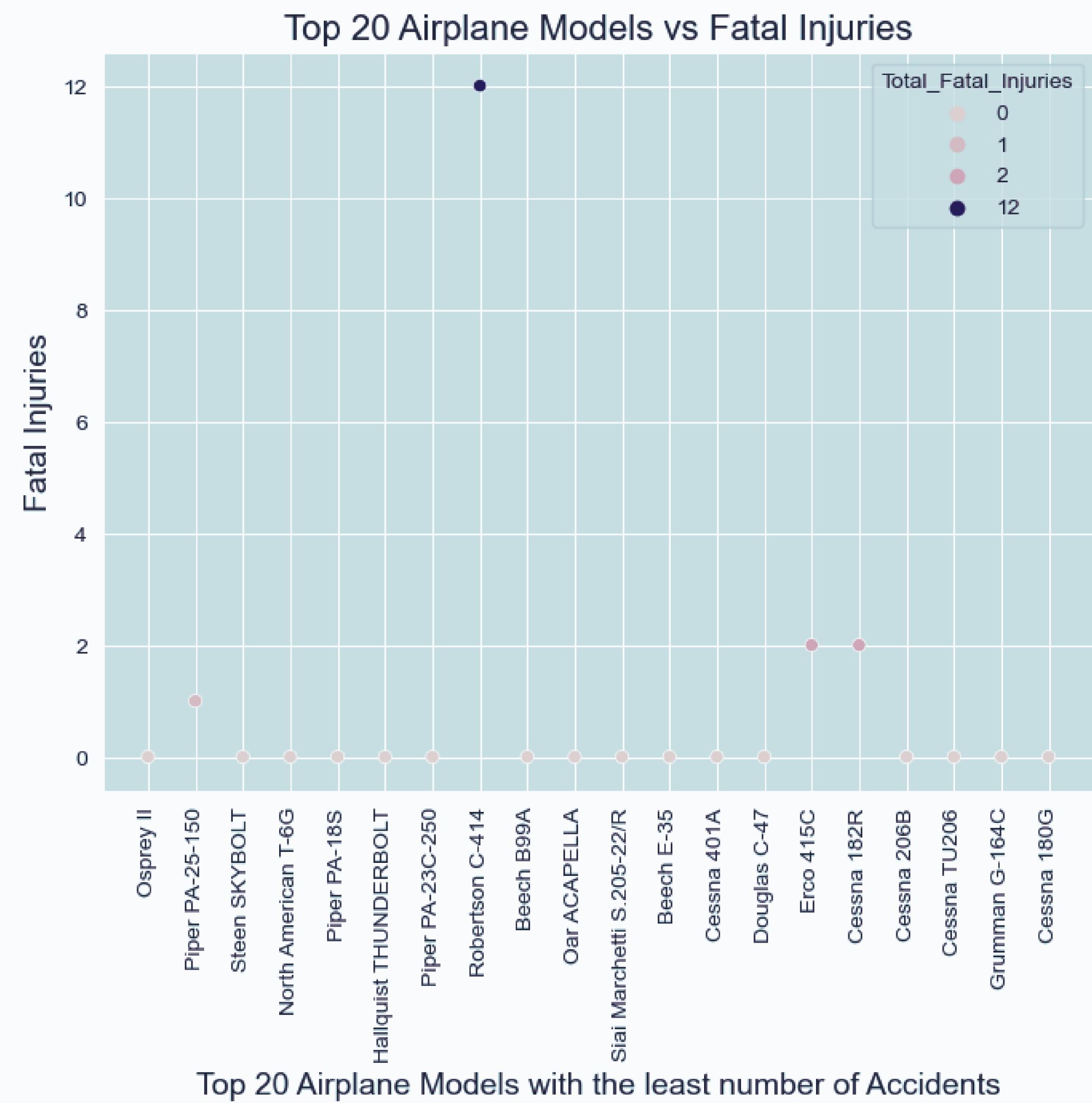
Hence having fewer engines may result in higher damage during accidents.

Violin plot of Aircraft Damage vs number of Engines



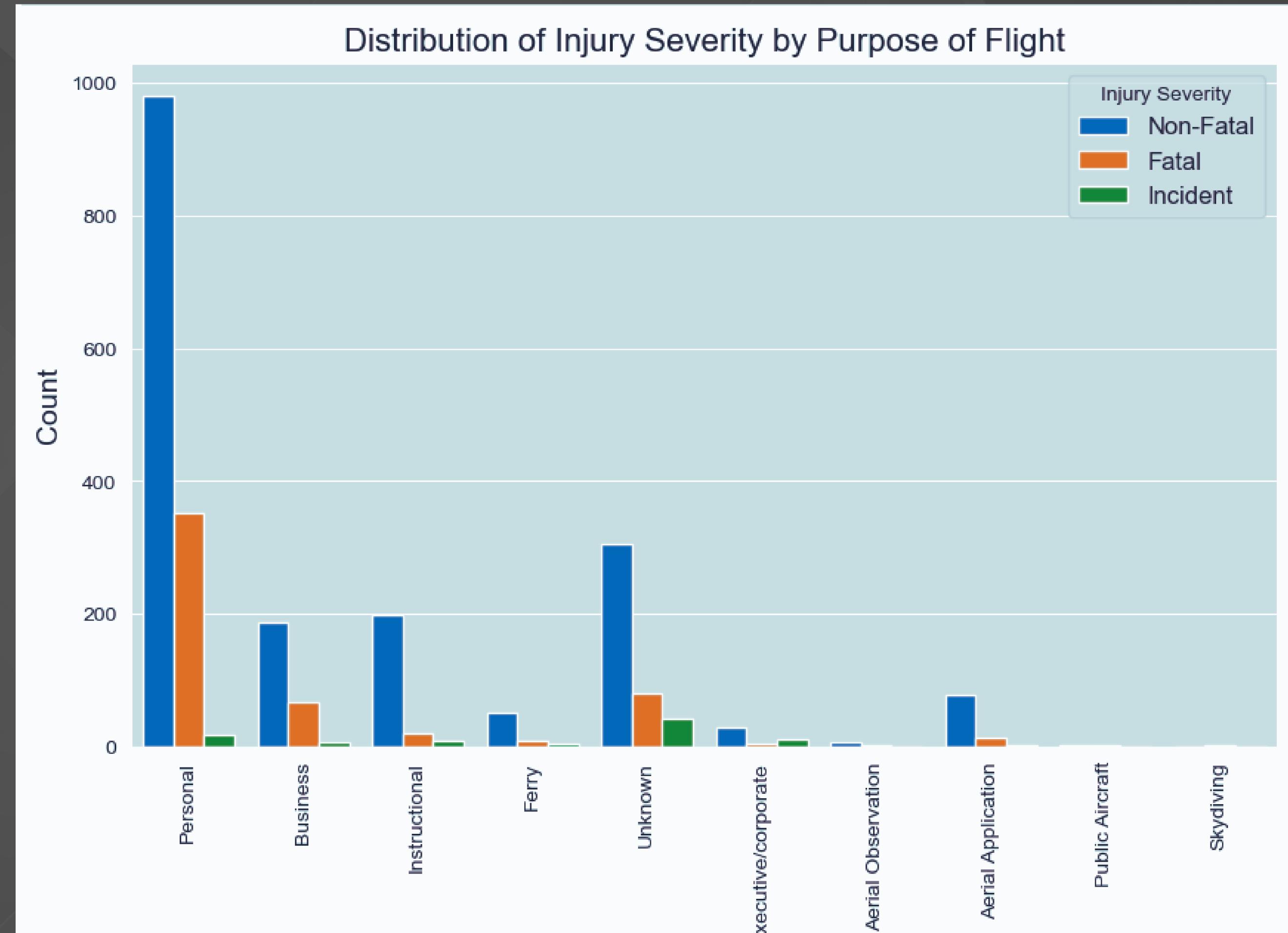
TOP 20 AIRPLANE MODELS VS FATAL INJURIES

This plot was meant to look into the top 20 airplanes with the least number of accidents. Piper PA -25-150, Robertson C-414, Erco 415C and Cessna 182R. Despite them recording a small number of accidents. The accidents that were recorded had fatal injuries with ROBERTSON C-414 having the most fatalities.



Distribution of Injury Severity by Purpose of Flight

From the plot you can see that, personal flights have a higher count for both non-fatal injuries and fatal outcomes compared to other purposes like 'Business' or 'Instructional.'



CONCLUSIONS

1. Accident Rates: While the analyzed aircraft ("top 20 with least accidents") had a lower overall accident frequency, some, like the Robertson C-414, exhibited a higher incidence of fatal accidents within those few occurrences.
2. Engine Type: Reciprocating engines had the highest accident rates and fatalities, while turbofan engines had the lowest.
3. Operation Purpose: Personal flights had a significantly higher risk of both non-fatal and fatal accidents compared to commercial or instructional purposes.
4. Severity: Aircraft with one or two engines experienced more substantial damage during accidents.
5. Landing/Takeoff: The majority of accidents occurred during takeoff and landing phases.
6. Since most accidents happened during VMC, weather seems to have played a lesser role compared to other factors like engine type, operation purpose (personal flights being riskier), and number of engines.



RECOMMENDATIONS

- 1.Prioritize Turbofan Engines: When selecting aircraft, prioritize models with turbofan engines for their lower accident and fatality rates.
- 2.Avoid Personal Use Focus: Initially, focus on commercial and instructional operations to mitigate risk associated with personal flights.
- 3.Mitigate Takeoff/Landing Risks: Implement procedures and pilot training specifically focused on takeoff and landing safety protocols.
- 4.Consider Multi-Engine Aircraft: While not a definitive safety guarantee, favoring aircraft with more than two engines might be a long-term consideration as the division matures.





THANK YOU



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