AVIATION SAFETY ANALYSIS

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OVERVIEW

This project analyzes historical aviation accident data from the National Transportation Safety Board (NTSB) to extract meaningful insights and actionable business recommendations to reduce aircraft risk and improve overall safety.

PROBLEM STATEMENT

The company Seinfield.Co Limited is contemplating whether to invest in a completely new industry, Aviation, by purchasing and operating aircraft for both the commercial and private sectors. However, leadership has limited knowledge of the risks associated with the aircraft types and models.

The goal of this project is to:

- Provide actionable insights to improve aviation safety and reduce the impact of accidents
- Identify the key risk factors such as accidents, incidents, and maintenance issues.
- Determine which aircraft models have the lowest risk.
- Provide clear recommendations for the initial aircraft purchase decisions.

This analysis aims to identify key factors contributing to accident severity to inform strategies for prevention and mitigation.

BUSINESS UNDERSTANDING

Aircraft accidents pose a risk to passengers, crew, and the aviation industry as a whole. This may lead to loss of life, financial losses, damage to aircraft, and property.

By understanding the factors that contribute to accident severity, we can develop strategies to:

- Minimize investment risk when expanding into aviation.
- Select aircraft that are reliable, safe, and cost-effective.
- Build trust with clients (commercial airlines and private customers) by operating safe aircraft.
- Optimize long-term operational costs by reducing the likelihood of accidents, failures, or unexpected maintenance.

DATA UNDERSTANDING

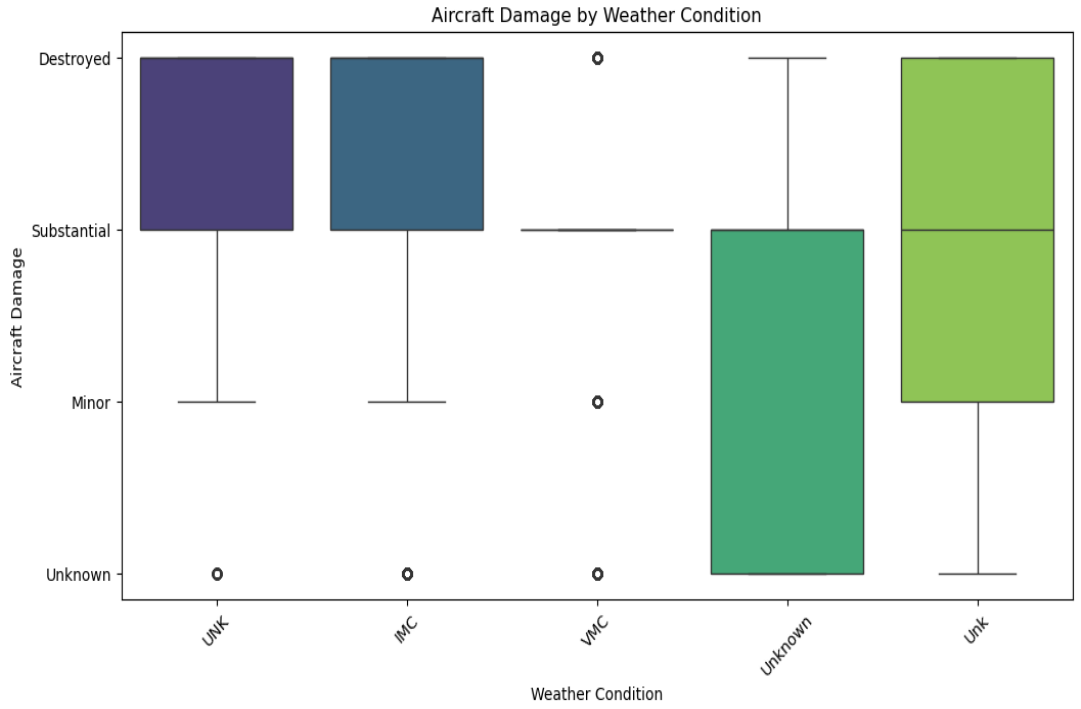
Data Source: NTSB Civil Aviation Accident Database (Site-Kaggle)

Period Covered: 1962–2023

- - The columns include:
- - Event ID -Unique identifier for each accident or incident event.
- - Investigation Type -Type of investigation: e.g., "Accident" or "Incident.
- - Accident Number -Official number assigned to the accident report.
- - Event Date -Date when the accident or incident occurred.
- - Location- Nearest location of the event.
- - Country -Country where the event took place.
- - Latitude -Geographic latitude of the event.
- - Longitude -Geographic longitude of the event.
- - Airport Code -Code of the airport closest to the event.
- - Airport Name -Full name of the nearby airport.
- - Injury Severity -Severity classification of injuries resulting from the event (e.g., "Fatal," "Serious," "Minor," "None").
- - Aircraft damage -Extent of aircraft damage (e.g., "Destroyed," "Substantial," "Minor," "None").
- - Aircraft Category -Type of aircraft involved.
- Registration Number – Tail number or aircraft registration.
- - Make - Manufacturer of the aircraft.
- - Model - Specific aircraft model.
- - Amateur Built - Whether the aircraft was amateur/home-built.
- - Number of Engines - Number of engines the aircraft has.
- - Engine Type -Type of engine on a given aircraft.
- - FAR Description - Regulatory classification under FAA rules.
- - Schedule - Whether the flight was scheduled or unscheduled.
- - Purpose of flight - Primary purpose of the flight (e.g., "Personal," "Business").
- - Air carrier - Air carrier name if it was a commercial flight.
- - Total Fatal Injuries - Number of people fatally injured in the event.
- - Total Serious Injuries - Number of people seriously injured but not killed.
- - Total Minor Injuries - Number of people with minor injuries.
- - Total Uninjured - Number of people aboard who were not injured.
- - Weather Condition - Weather at the time of the event.
- - phase of flight - Phase of flight during the event (e.g., "Takeoff," "Landing").
- Report Status - Status of the accident report (e.g., "Final").
- - Publication Date - Date when the report was made publicly available.

Aircraft damage caused by weather conditions

This chart illustrates the relationship between weather conditions and the extent of damage to the aircraft. Each box represents the range of damage observed for a particular weather condition. The line inside the box shows the median damage level, and the whiskers show the variability. The circles represent outlier data points. Outliers are extreme values in a dataset.



Key takeaways:

•This visualization helps us understand if certain weather conditions are associated with more severe aircraft damage.

•For instance, we see accidents in poor visibility conditions (like IMC) tend to result in more extensive damage.

Recommendations:

- Need for improved safety measures in challenging weather.
- Hiring advanced pilots for flying in adverse weather conditions.
- Improvement in aircraft technology, especially in low visibility conditions.
- Proper procedures should be implemented during bad weather seasons.

Fatal injuries by engine type

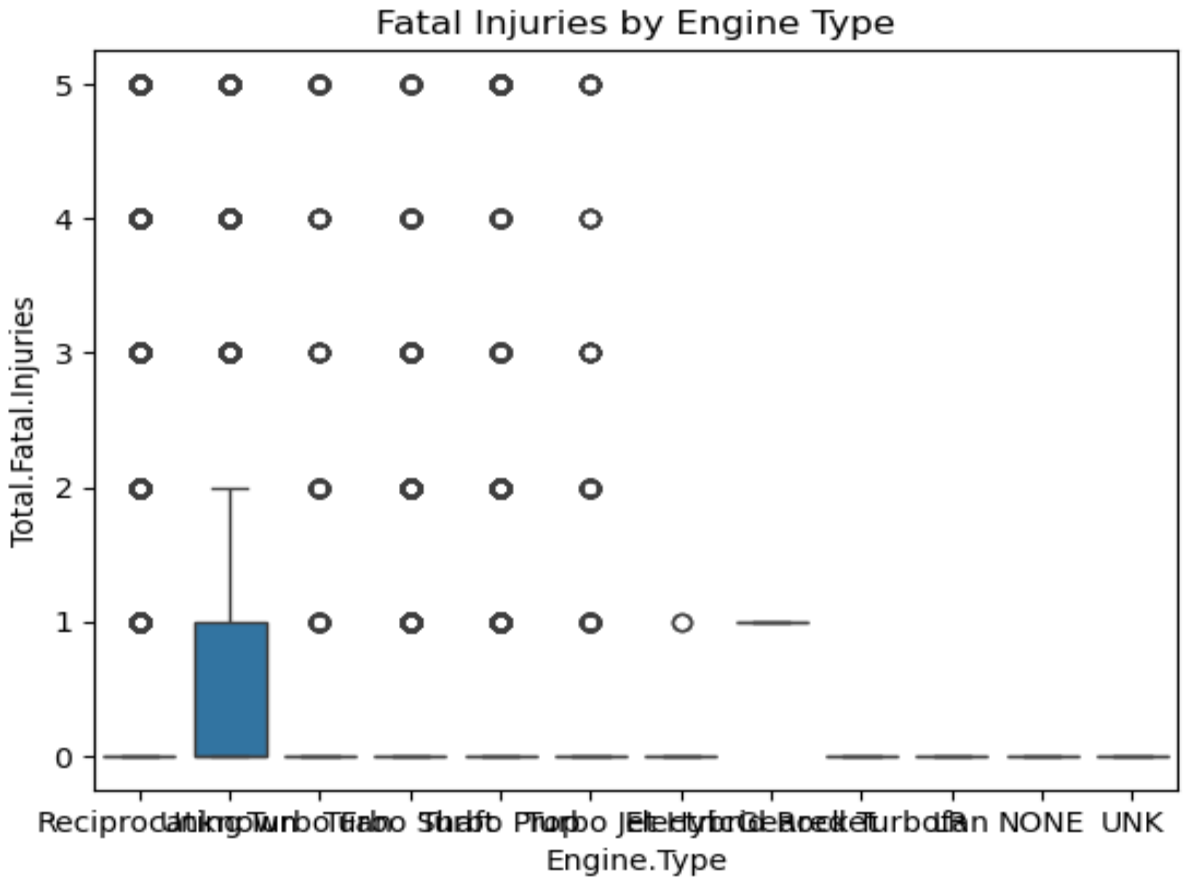
This chart compares the number of fatal injuries with different engine types. The box shows the typical range of fatal injuries for each engine type, and the circles show unusual cases with higher number of fatalities.

Key Takeaways:

- This visualization helps identify if certain engine types are associated with accidents that have higher numbers of fatal injuries.
- For example, we can see if accidents involving a particular engine type tend to have more fatalities than others.

Recommendations:

- Better safety protocols and maintenance procedures for aircraft with these engine types.
- Investigate potential design modifications or enhanced safety features to be put in place.



Injury severity by aircraft category

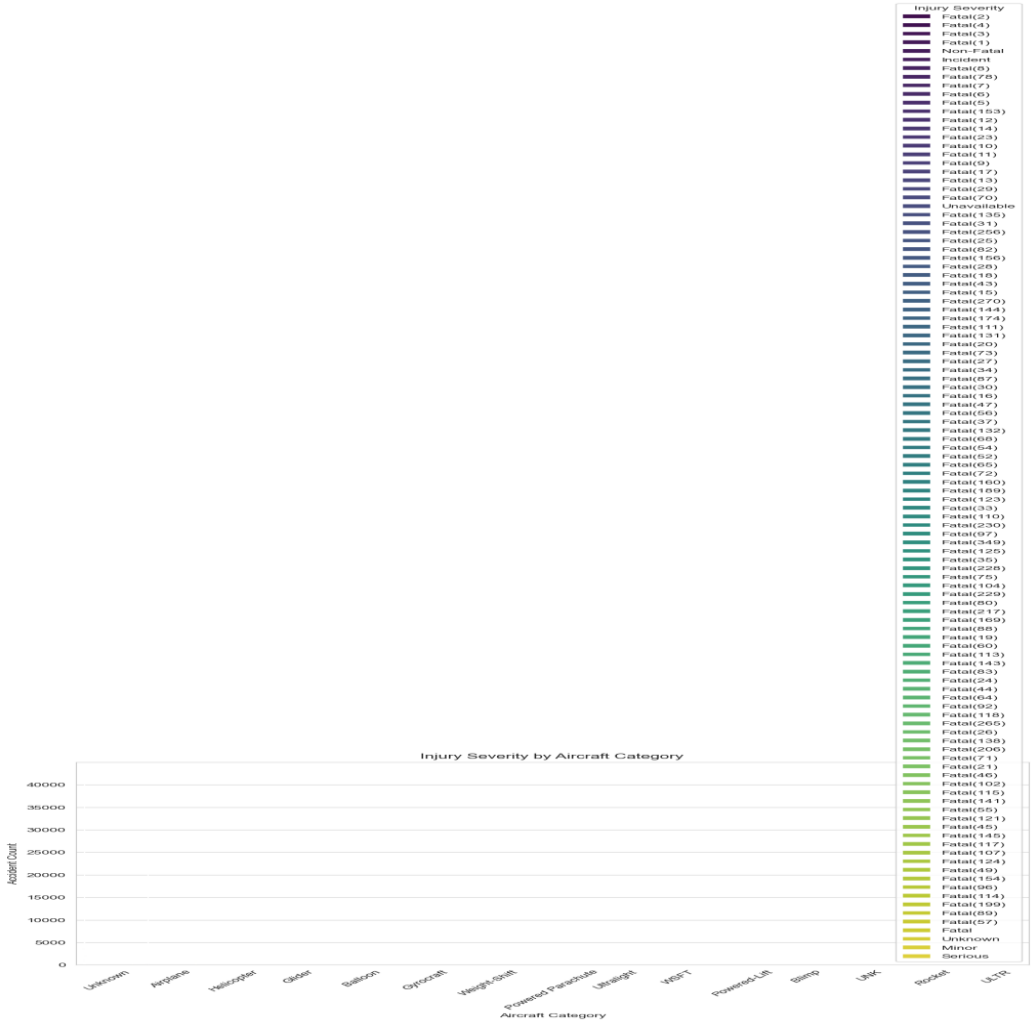
This chart shows how the severity of injuries varies across different categories of aircraft (e.g., commercial). The different colored segments within each bar represent the number of accidents with each level of injury severity, from 'No Injury' to 'Fatal'.

Key takeaways:

- This visualization helps us understand which aircraft categories are associated with more severe injuries.
- For example, we can see if certain categories have a higher proportion of fatal accidents.

Recommendations:

- Focusing on targeted safety interventions for categories with a higher proportion of severe accidents.
- Enhanced safety training, stricter maintenance protocols, or the development of improved safety features for these aircraft need to be implemented.



RECOMMENDATIONS

•The analysis of fatal injuries by engine type suggests that certain engine types may be associated with a higher risk of fatal accidents.
•Therefore, I recommend a focused review of safety protocols and maintenance procedures for aircraft with these engine types.
•Investigate potential design modifications or enhanced safety features.

-By addressing the specific risks associated with these engine types, we can reduce the number of fatal injuries in aircraft accidents.

NEXT STEPS

- Further analysis could explore other factors such as;
- pilot experience
- aircraft age and
- specific accident types.

- Recommendation for a cost-benefit analysis of the proposed safety interventions.
- The findings should be integrated into safety management systems and pilot training programs.
- Continuous monitoring of accident data to track the effectiveness of implemented safety measures and identify any emerging trends.

QUESTIONS SESSION.

THANK YOU.

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