New York — Manila

Boarding Pass

Aircraft Risk Analysis for Business Evaluation.

Project 1 Presentation

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Agenda

Overview
Business Understanding

Data Understanding
Data Analysis

Conclusion

Recommendation
Next Steps
AOBs

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OVERVIEW

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Overview

The company plans to diversify its portfolio by entering the aviation industry, focusing on acquiring and operating airplanes for commercial and private clients. This project analyzes aviation accident data from Kaggle to identify aircraft with the lowest risk profile. The study will provide insights into which aircraft present the least safety, financial, and operational risks by conducting a descriptive analysis of factors such as accident frequency, severity, and related variables. This analysis will guide the company's decision-making process in selecting the most suitable airplanes for purchase.

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Business Understanding

To reduce safety and financial liabilities in aircraft operations, the company can focus on selecting the safest and most reliable airplane models. This project aims to:

1.Identify airplane models with minimal risk profiles

2.Analyze the severity and frequency of aviation accidents.

3.Examine factors contributing to these accidents.

4.Offer data-driven recommendations for choosing the most suitable airplanes.

Doing so will help the company to make informed decisions on which airplanes to purchase.

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DATA UNDERSTANDING

Data Understanding

- The aviation accident dataset sourced from Kaggle originally obtained from the National Transportation Safety Board contains comprehensive records of airplane accidents. Each accident is uniquely identified by its 'Accident Number' and includes key details such as the date, location, aircraft make and model, and injury severity. Additionally, the dataset records factors such as weather conditions and the flight phase, enabling a thorough analysis of accident patterns, risk factors, and the relationships between aircraft models, accident severity, and environmental influences.

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DATA ANALYSIS

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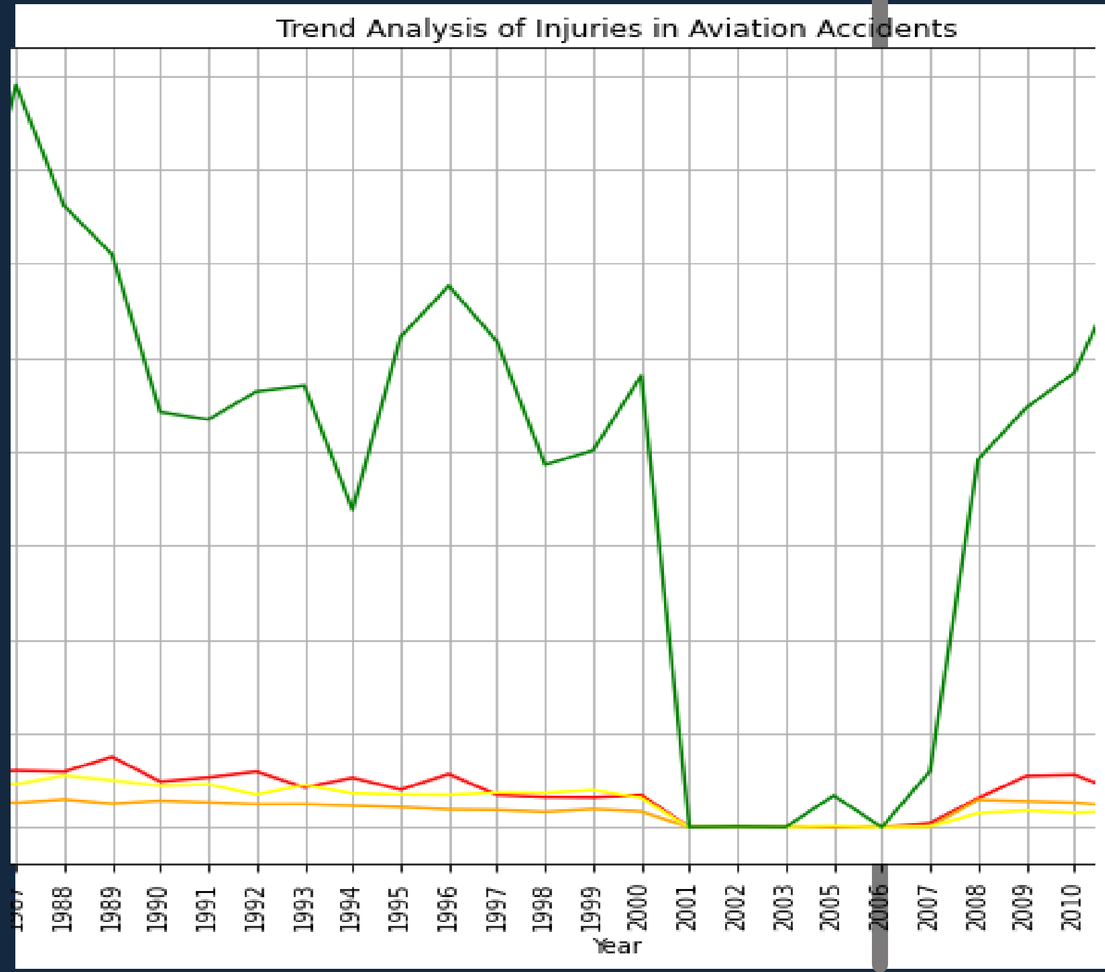
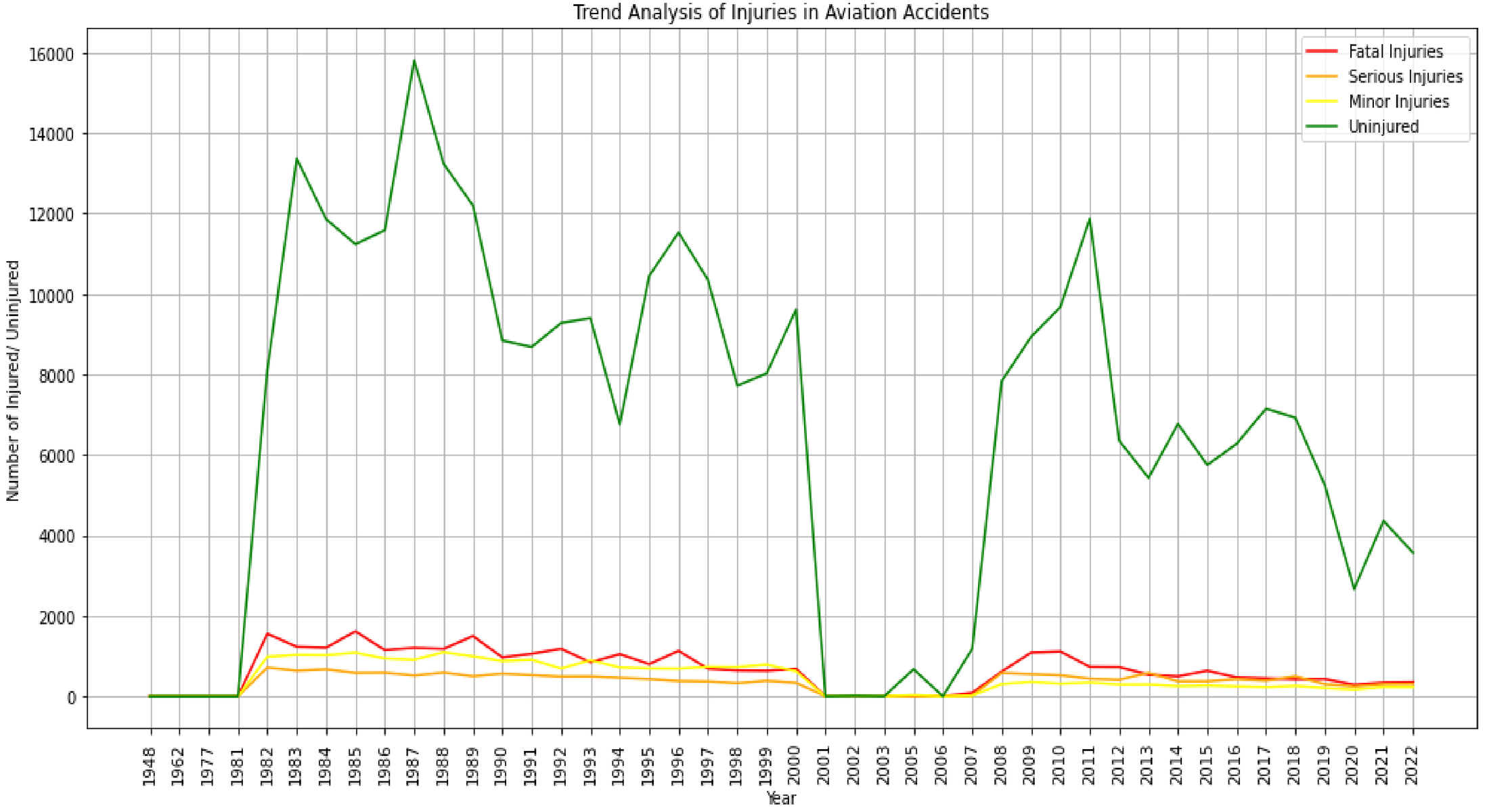


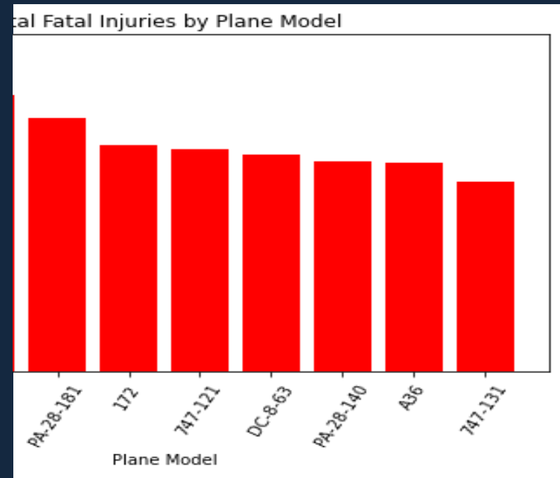
Trend Analysis of Injuries and Uninjured Passengers in Aviation Accidents Over Time¶

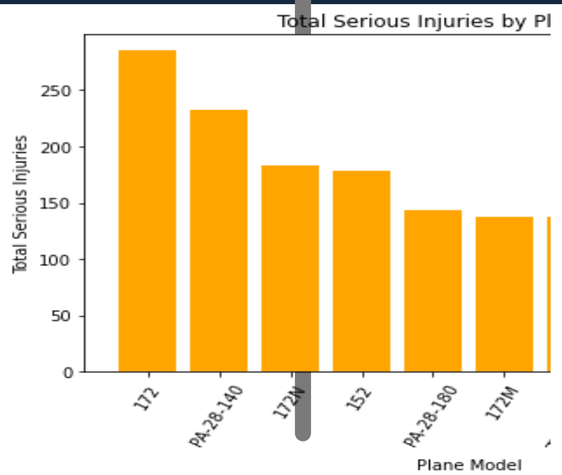
It appears that the total number of uninjured passengers has consistently been higher than the total number of fatal, serious, or minor injuries from 1948 to 2022, which is a positive sign. While there have been fluctuations throughout this period, it's worth noting that the number of uninjured passengers has generally decreased since 1987.

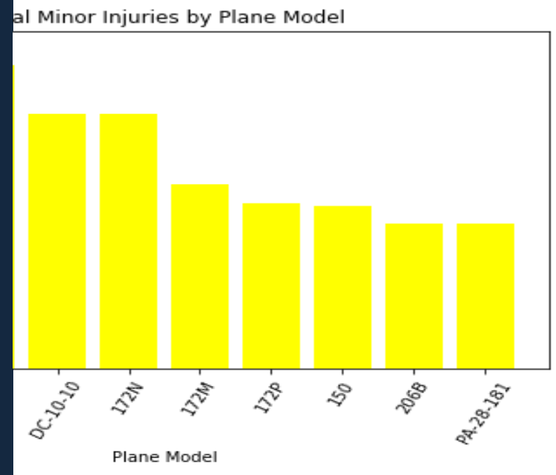
In contrast, the number of fatal, serious, and minor injuries has remained relatively low, staying below 2,000 people over the 74 years. This steady trend suggests that overall, injuries have decreased over the years, indicating that safety standards in aviation have improved significantly.

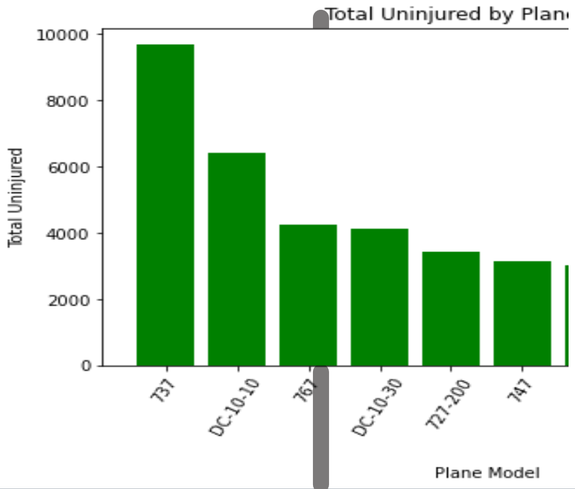
These trends highlight the effectiveness of safety measures and innovations over time, which have contributed to reducing the severity and frequency of injuries in aviation accidents.


Trend Analysis of Injuries in Aviation Accidents
Fatal Injuries
Serious Injuries
Minor Injuries
Uninjured
Number of Injured/ Uninjured
16000
14000
12000
10000
8000
6000
4000
2000
0
1948
1962
1977
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year



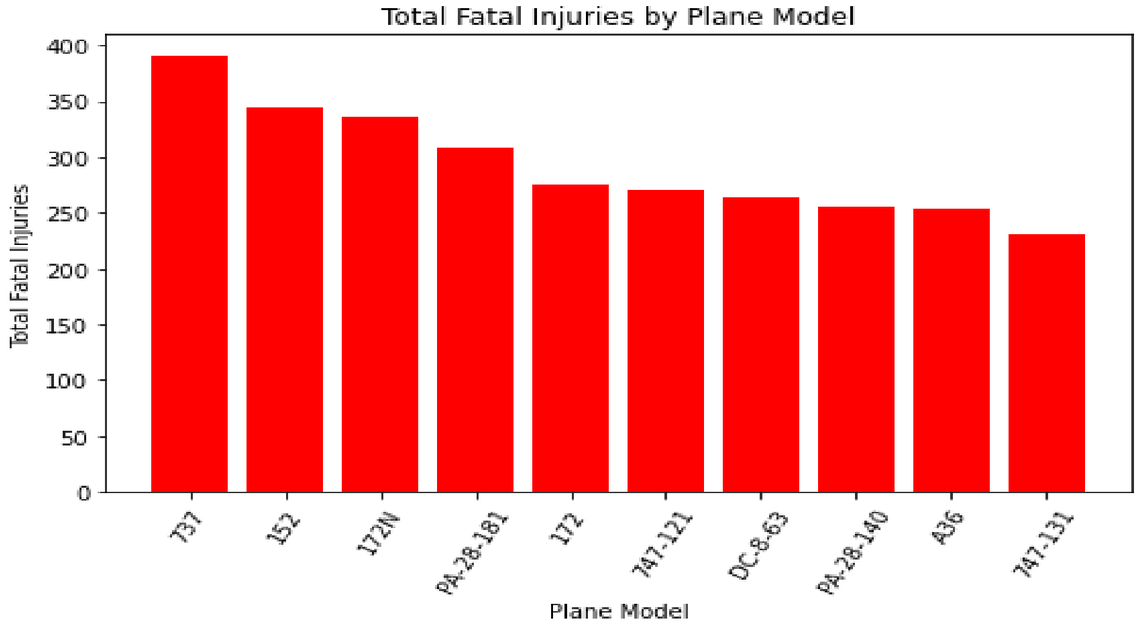


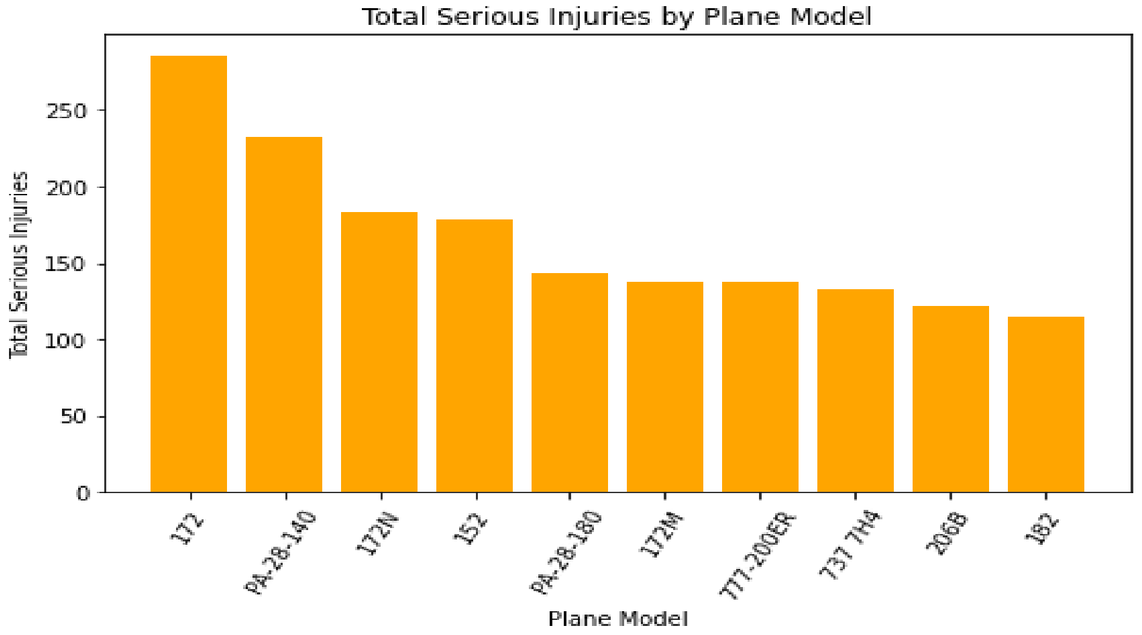


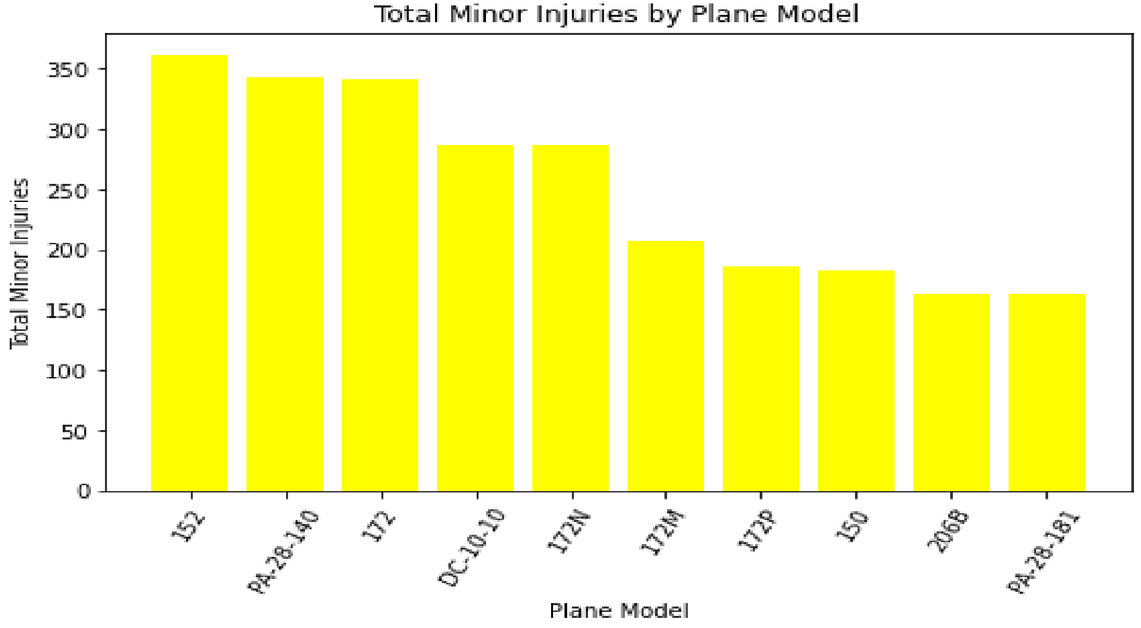


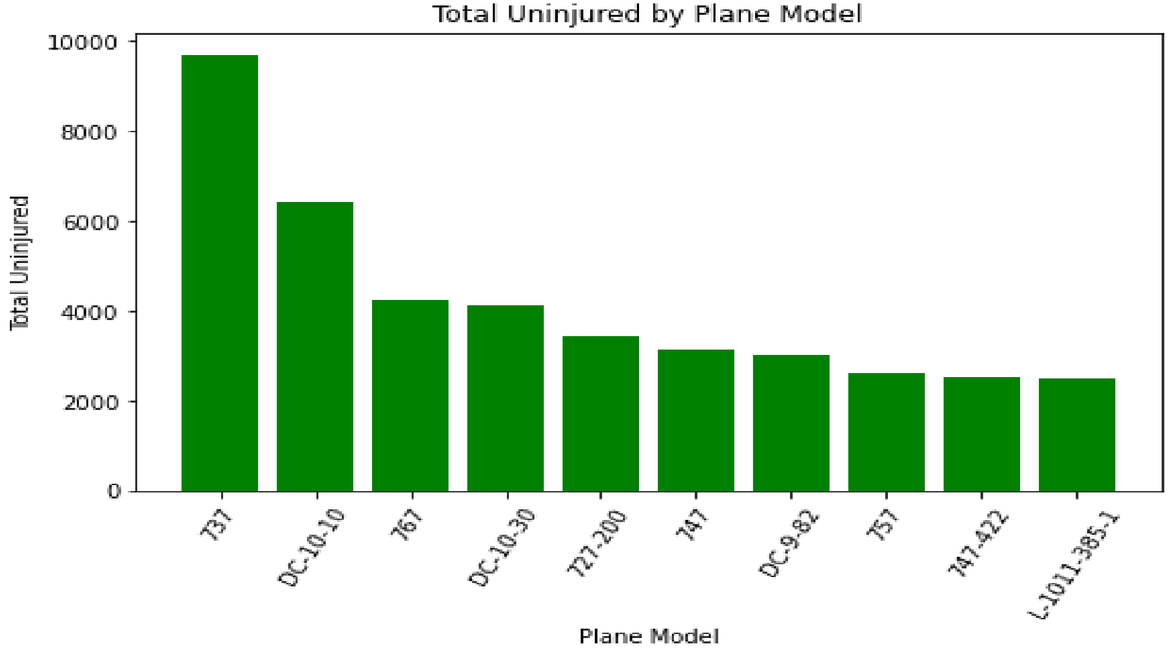
Injured Passengers by the Plane Model

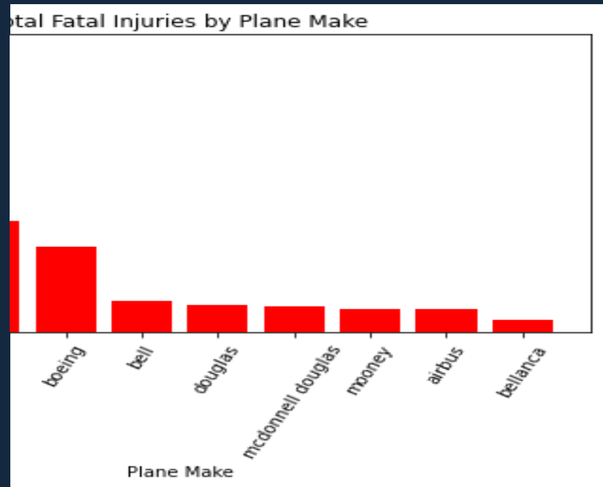
- Model 737 has the most fatal injuries.
- Model 172 has the most serious injuries.
- Model 152 has the most minor injuries.
- Model 737 has the most uninjured.
- Even though model 737 has the most fatal injuries, it also has the most uninjured which is positive.

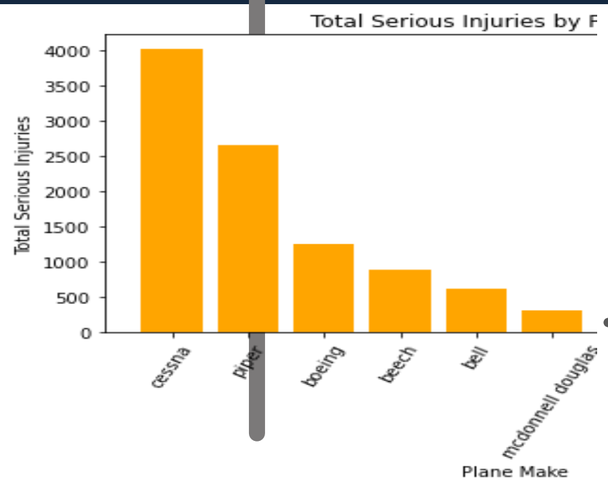

Total Fatal Injuries by Plane Model
Total Fatal Injuries
0
50
100
150
200
250
300
350
400
737
152
172N
PA-28-181
172
747-121
DC-8-63
PA-28-140
A36
747-131
Plane Model

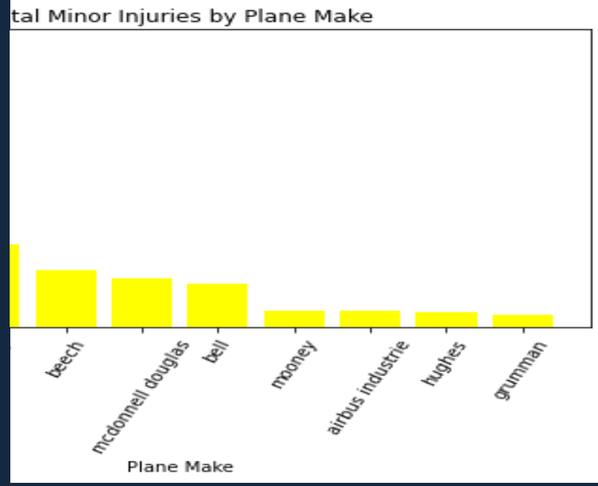

Total Serious Injuries by Plane Model
Total Serious Injuries
0
50
100
150
200
250
172
PA-28-140
172N
152
PA-28-180
172M
777-200ER
737 7H4
206B
182
Plane Model

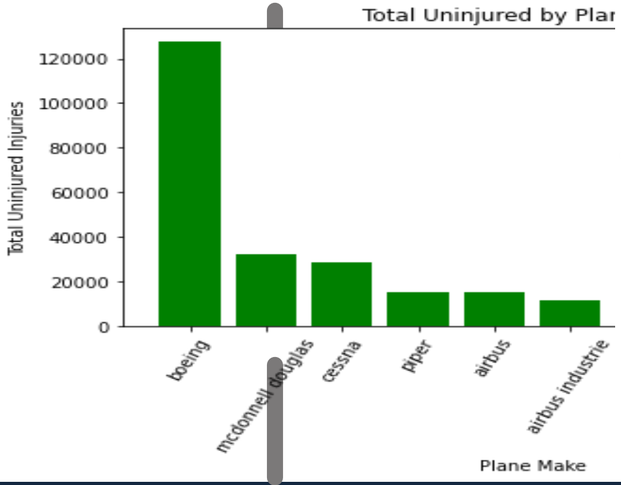

Total Minor Injuries by Plane Model
Total Minor Injuries
0
50
100
150
200
250
300
350
152
PA-28-140
172
DC-10-10
172N
172M
172P
150
206B
PA-28-181
Plane Model


Total Uninjured by Plane Model
Total Uninjured
0
2000
4000
6000
8000
10000
737
DC-10-10
767
DC-10-30
727-200
747
DC-9-82
757
747-422
L-1011-385-1
Plane Model



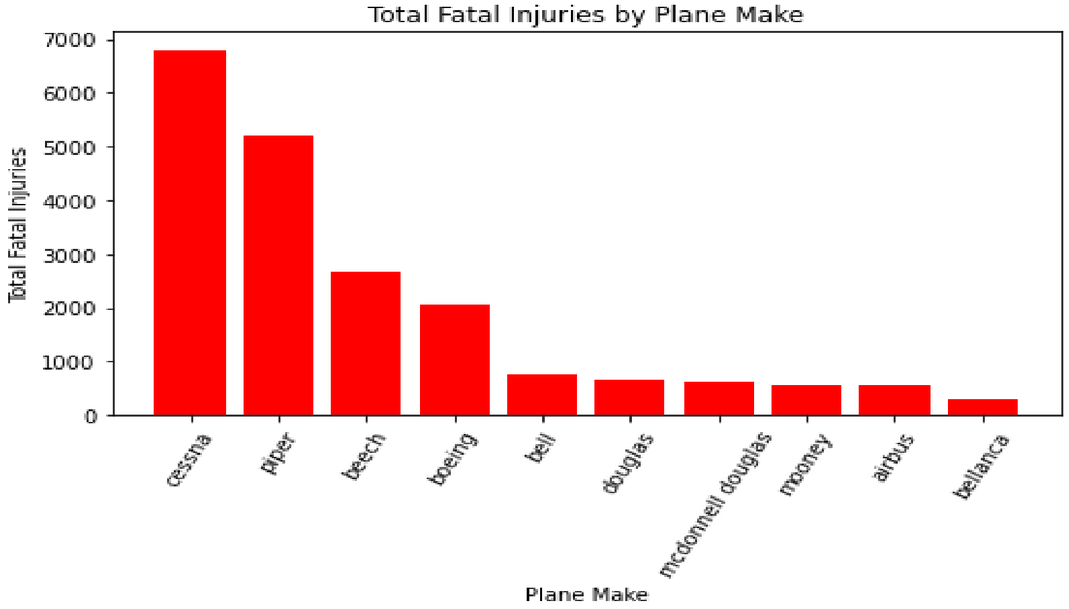


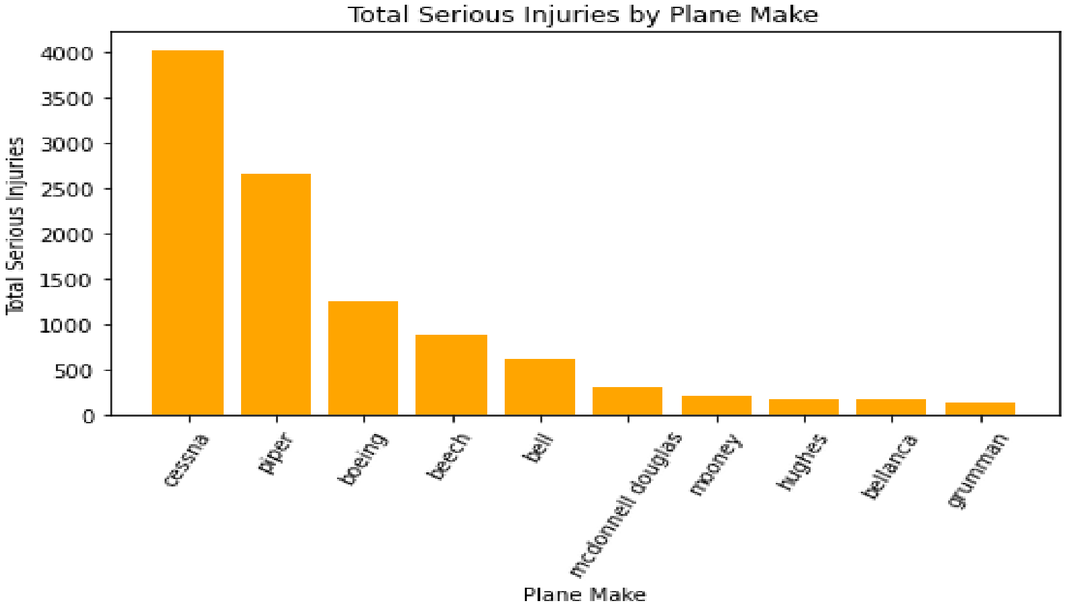


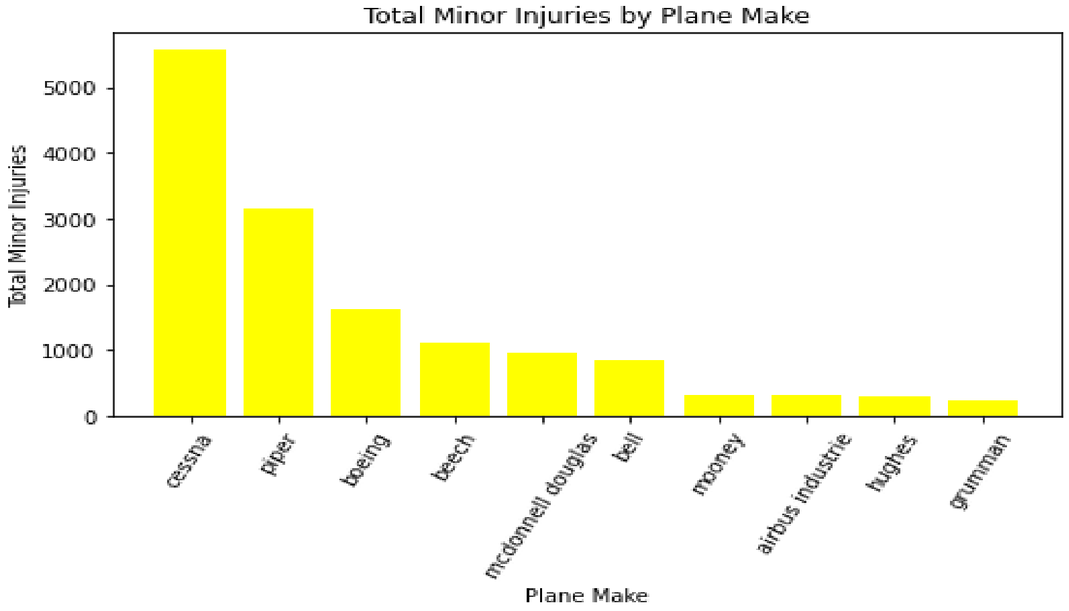


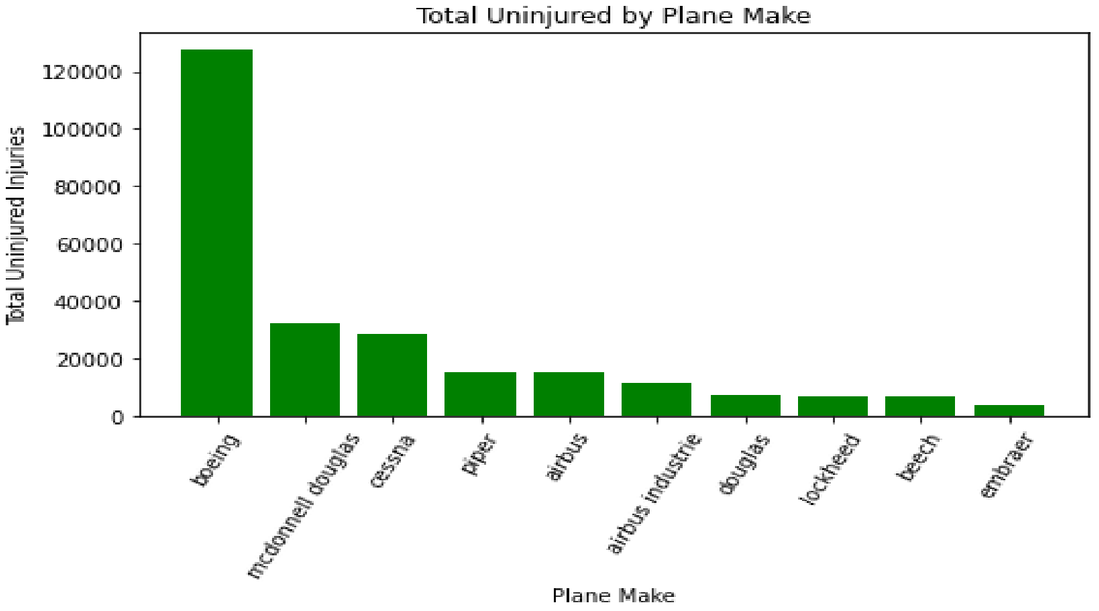
Injured Passengers by Plane Make

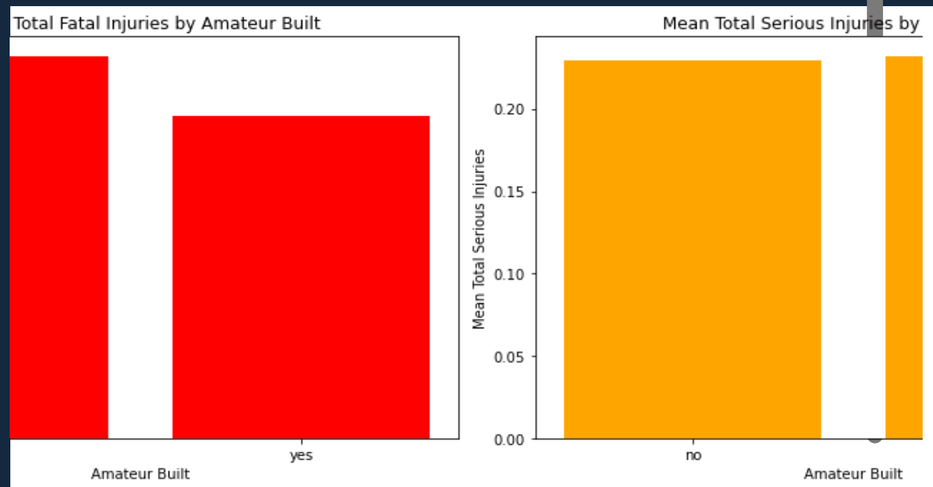
- Cessna has the most fatal, serious and minor injuries reported.
- Boeing has the most uninjured reported.

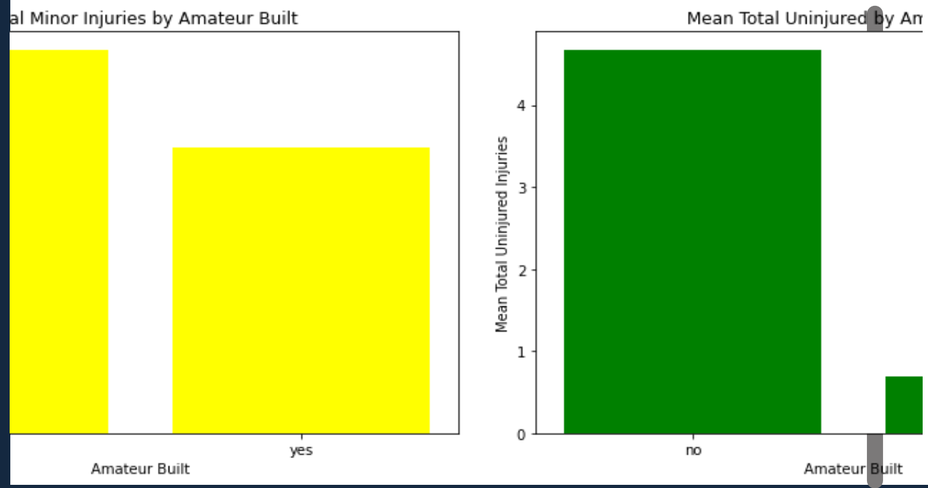

Total Fatal Injuries by Plane Make
Total Fatal Injuries
7000
6000
5000
4000
3000
2000
1000
0
cessna
piper
beech
boeing
bell
douglas
mcdonnell douglas
mooney
airbus
bellanca
Plane Make


Total Serious Injuries by Plane Make
Total Serious Injuries
4000
3500
3000
2500
2000
1500
1000
500
0
cessna
piper
boeing
beech
bell
mcdonnell douglas
mooney
hughes
bellanca
grumman
Plane Make


Total Minor Injuries by Plane Make
Total Minor Injuries
5000
4000
3000
2000
1000
0
cessna
piper
boeing
beech
mcdonnell douglas
bell
mooney
airbus industrie
hughes
grumman
Plane Make

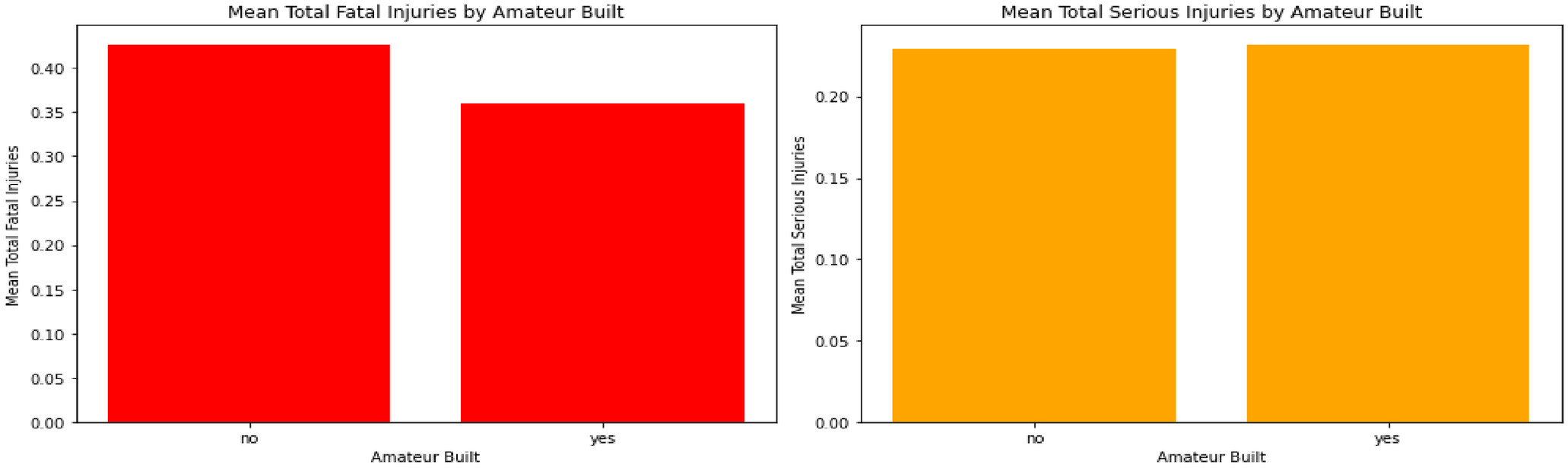

Total Uninjured by Plane Make
Total Uninjured Injuries
120000
100000
80000
60000
40000
20000
0
boeing
mcdonnell douglas
cessna
piper
airbus
airbus industrie
douglas
lockheed
beech
embraer
Plane Make



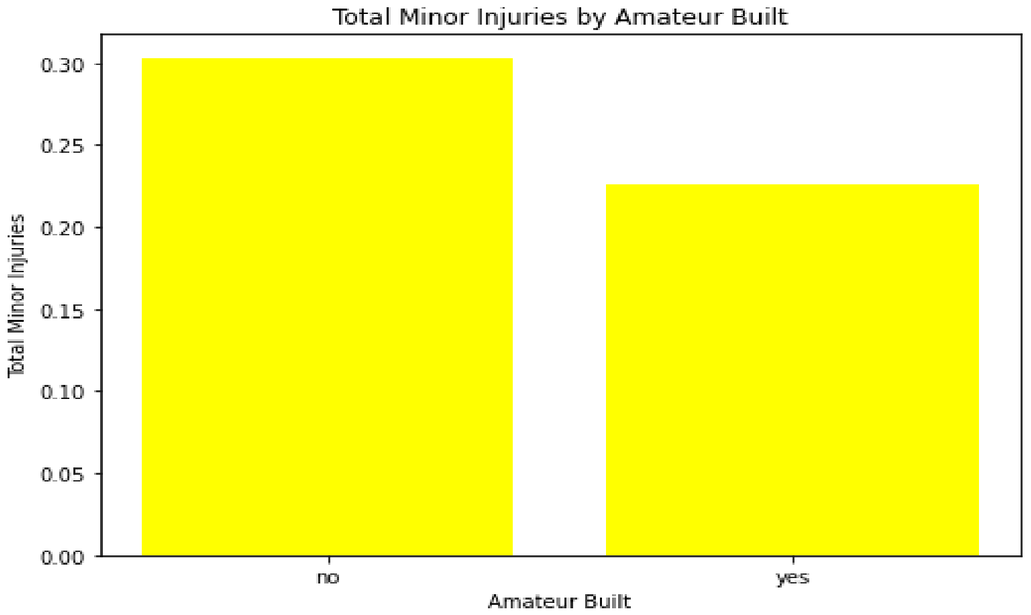


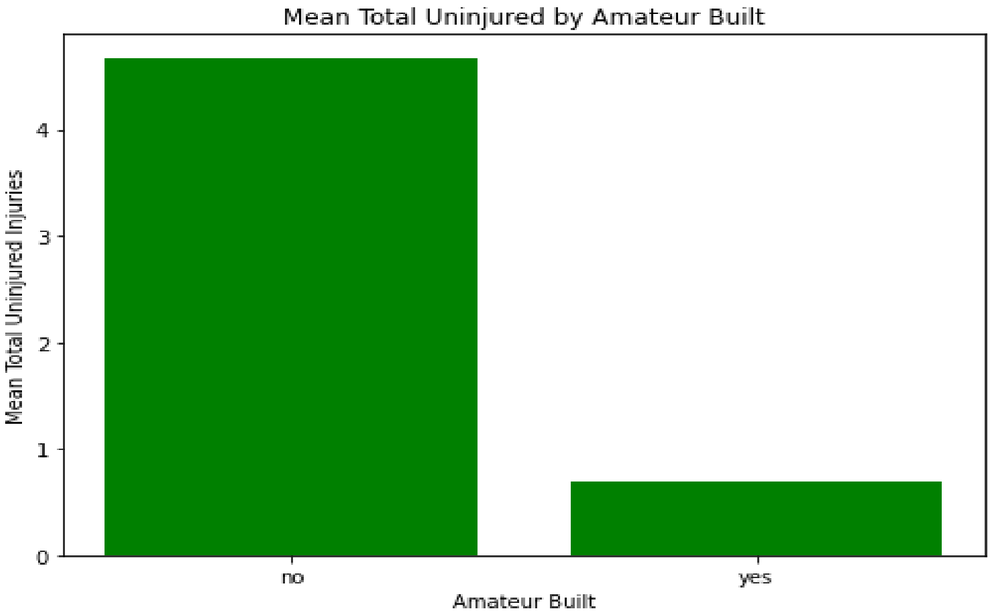
Injured Passengers by Amateur Built¶

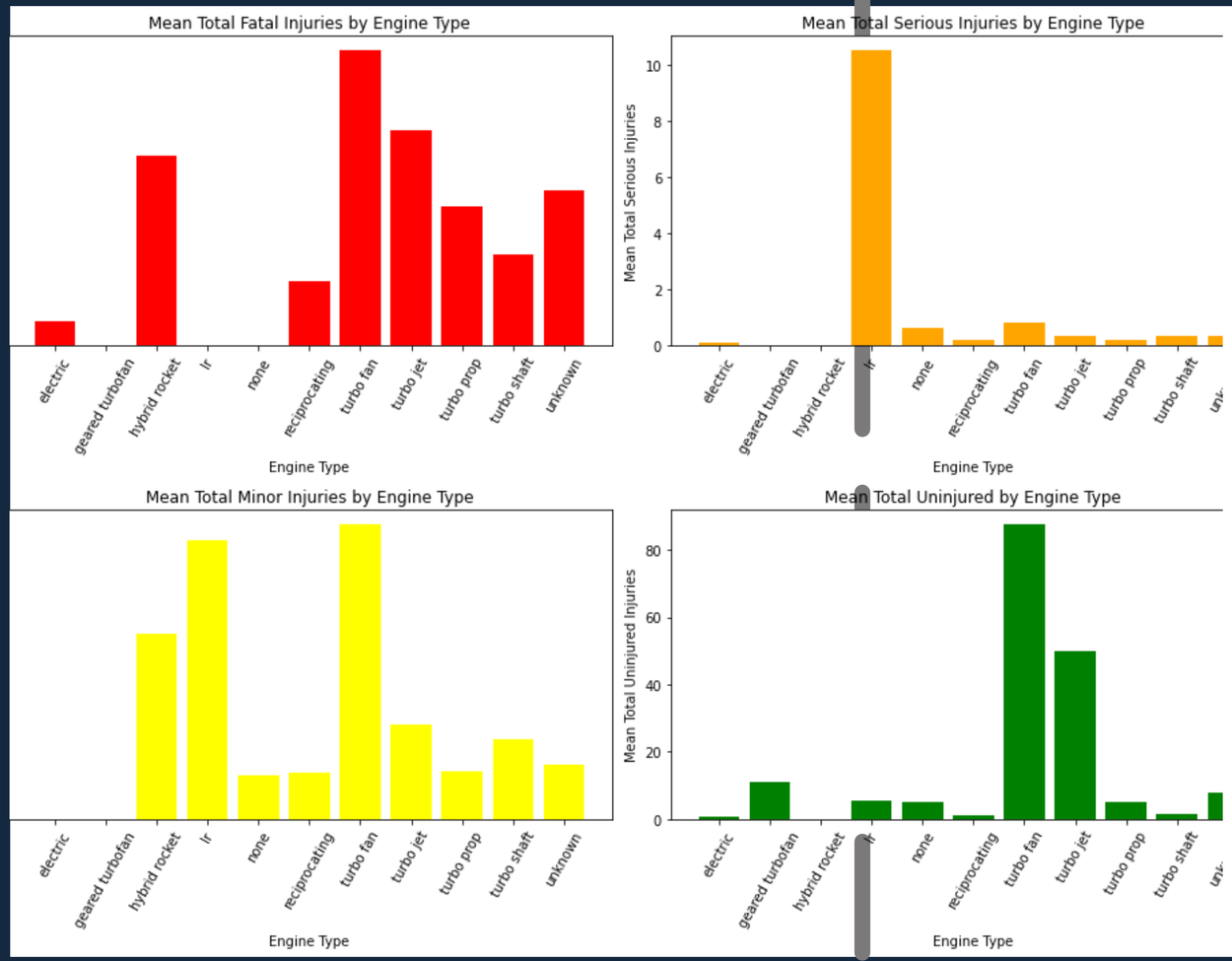
- It is shown that:
- Non-amateur-built planes have more fatal, minor and uninjured.
- Amateur-built planes have more serious injuries. As shown in the data, the gap between non-amateur-built and amateur-built planes in terms of uninjured passengers is more significant than the gap for fatal injuries. This suggests that non-amateur-built planes tend to have a higher number of uninjured passengers, which implies that they are generally safer, even though they report a higher number of fatal injuries.
- While non-amateur-built planes may experience more fatal injuries, the overall safety profile, as indicated by the higher number of uninjured passengers, suggests that professionally built aircraft are better equipped to protect passengers in the event of an accident. This further supports the idea that the safety features and design of professionally built planes contribute to minimizing the severity of injuries.


Mean Total Fatal Injuries by Amateur Built
Mean Total Fatal Injuries
0.00
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
no
yes
Amateur Built

Mean Total Serious Injuries by Amateur Built
Mean Total Serious Injuries
0.00
0.05
0.10
0.15
0.20
no
yes
Amateur Built

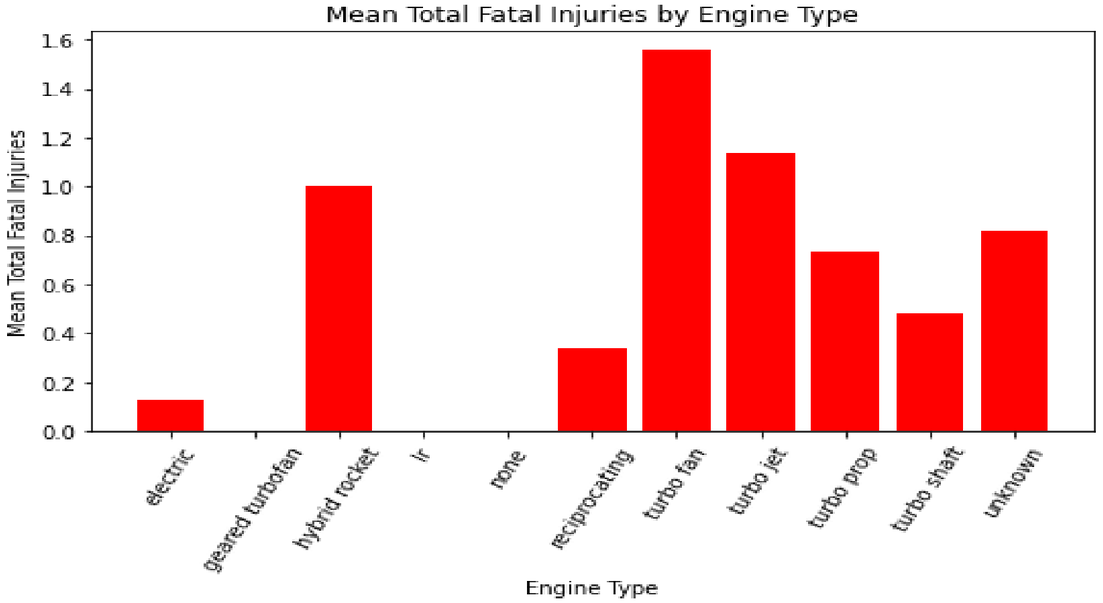

Total Minor Injuries by Amateur Built
Total Minor Injuries
0.00
0.05
0.10
0.15
0.20
0.25
0.30
no
yes
Amateur Built

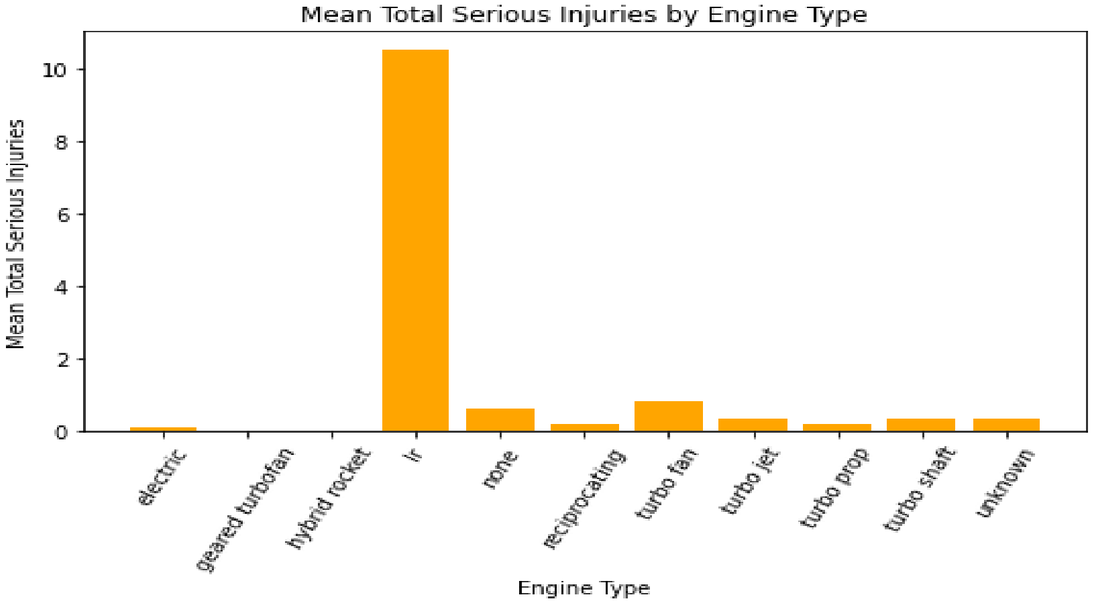

Mean Total Uninjured by Amateur Built
Mean Total Uninjured Injuries
0
1
2
3
4
no
yes
Amateur Built

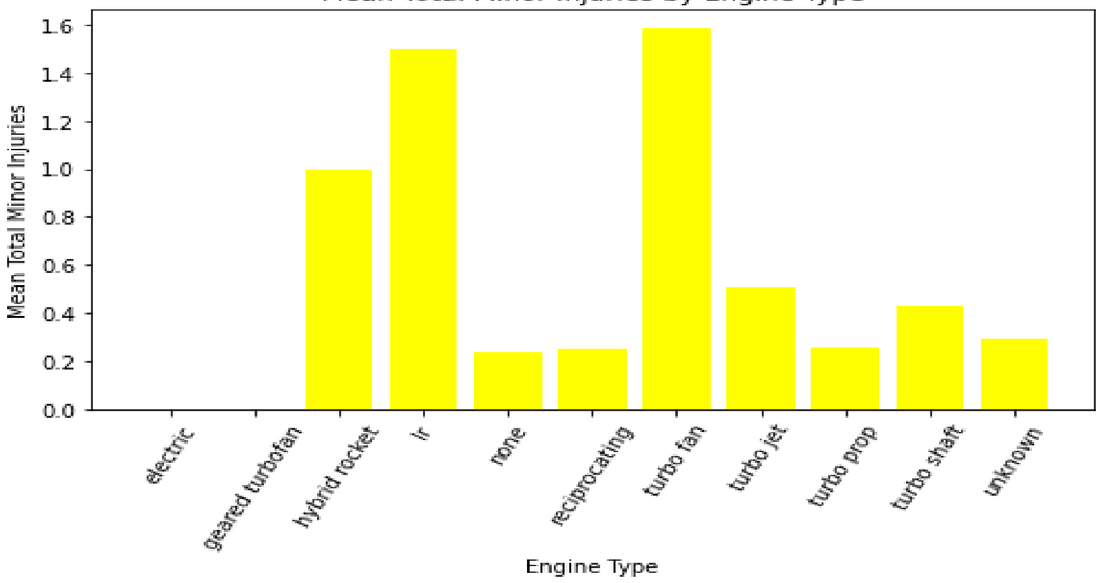


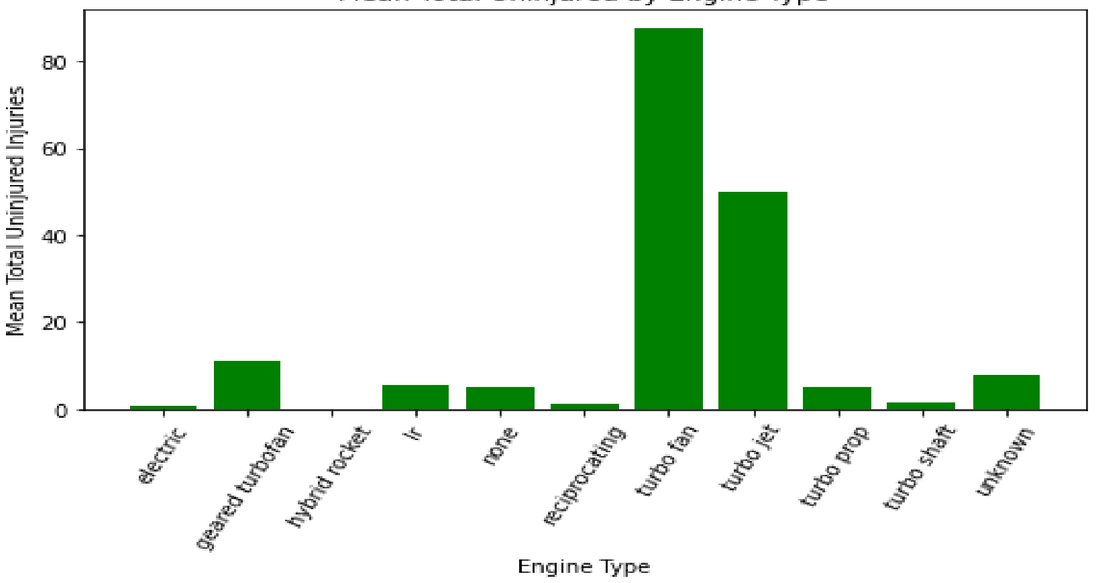
Injured Passengers by Type of Engine of the Plane

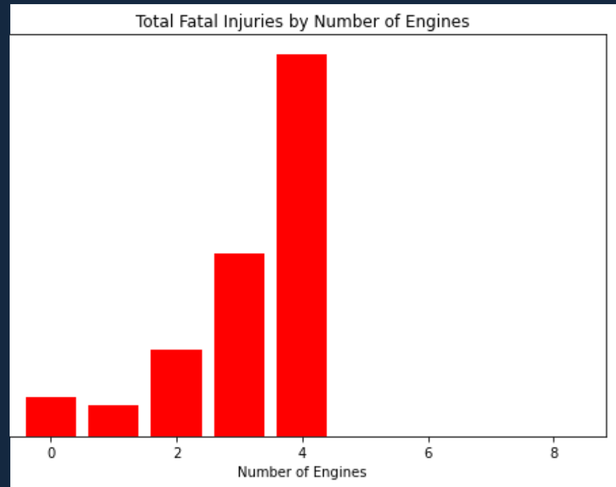
- Turbo tan engine has the most fatal, minor injuries and uninjured.
- Lr engine has the most serious injuries.

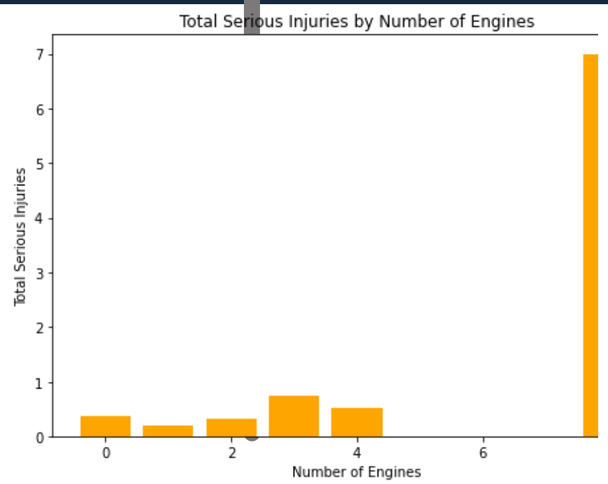

Mean Total Fatal Injuries by Engine Type
Mean Total Fatal Injuries
Engine Type
electric
geared turbofan
hybrid rocket
ir
none
reciprocating
turbo fan
turbo jet
turbo prop
turbo shaft
unknown

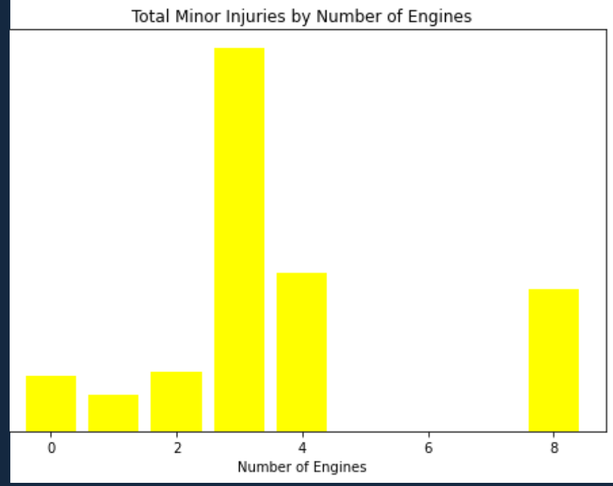

Mean Total Serious Injuries by Engine Type
Mean Total Serious Injuries
Engine Type
electric
geared turbofan
hybrid rocket
ir
none
reciprocating
turbo fan
turbo jet
turbo prop
turbo shaft
unknown

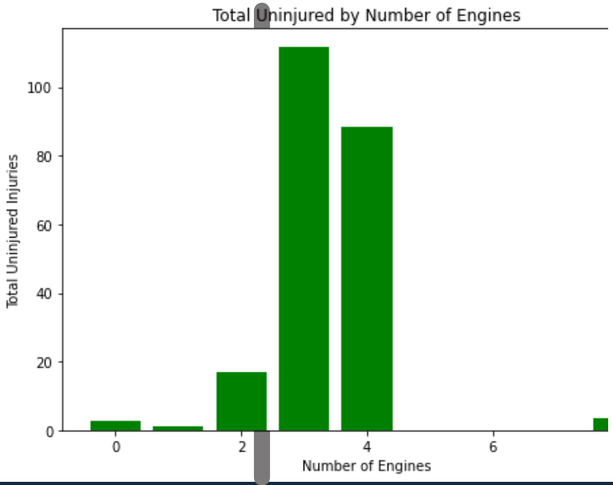

Mean Total Minor Injuries by Engine Type
Mean Total Minor Injuries
Engine Type
electric
geared turbofan
hybrid rocket
ir
none
reciprocating
turbo fan
turbo jet
turbo prop
turbo shaft
unknown


Mean Total Uninjured by Engine Type
Mean Total Uninjured Injuries
Engine Type
electric
geared turbofan
hybrid rocket
ir
none
reciprocating
turbo fan
turbo jet
turbo prop
turbo shaft
unknown



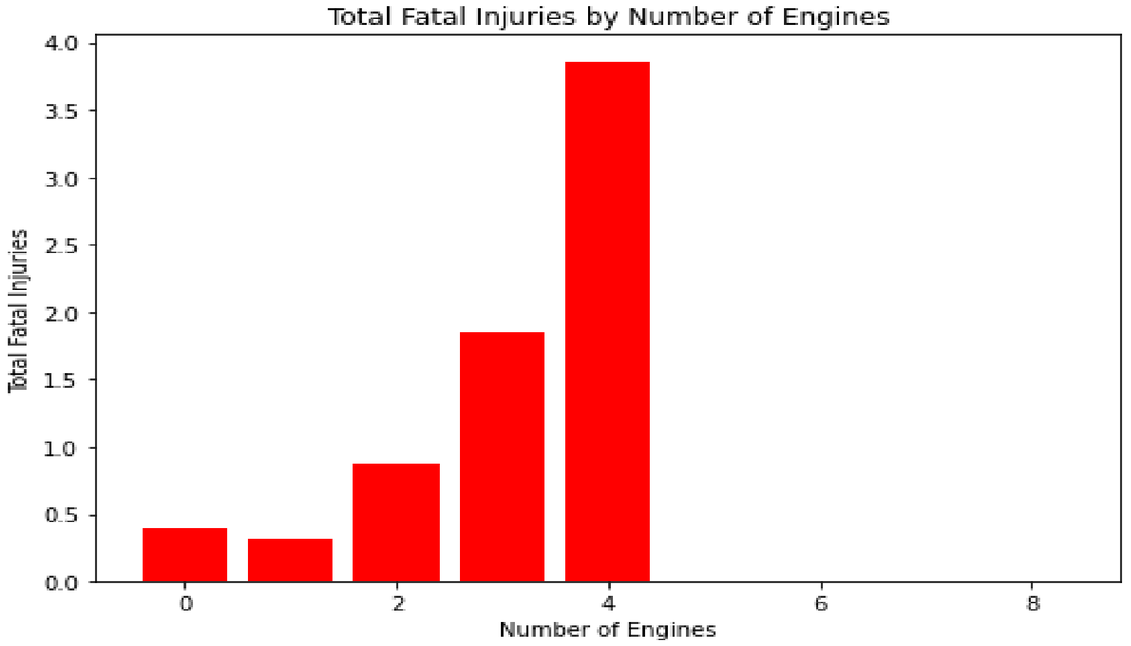


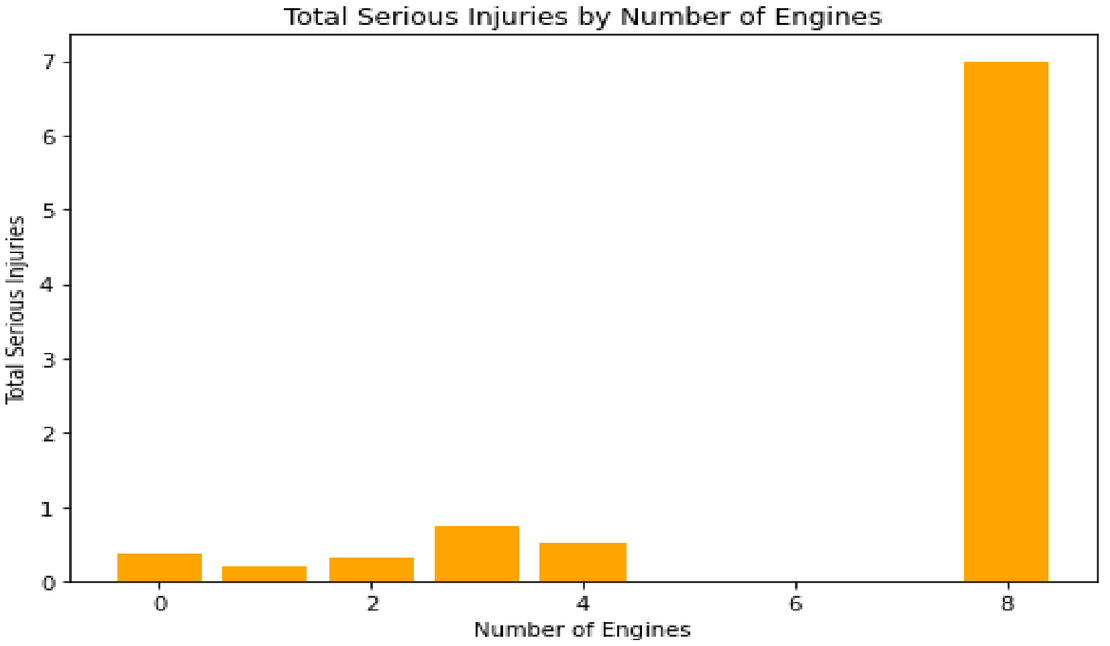


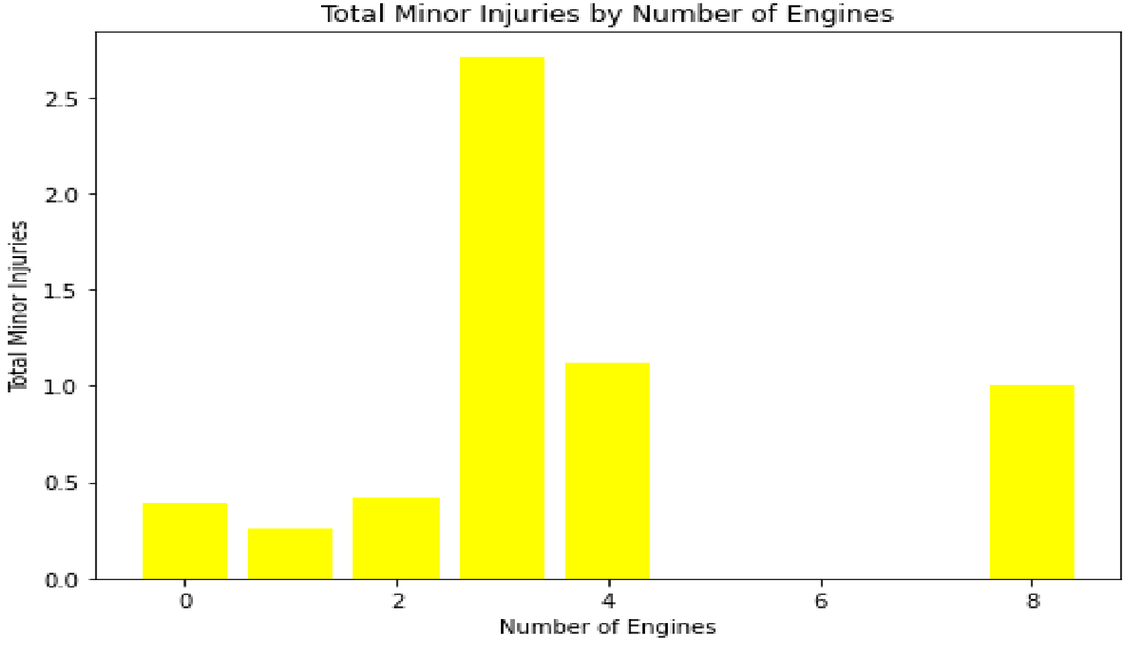


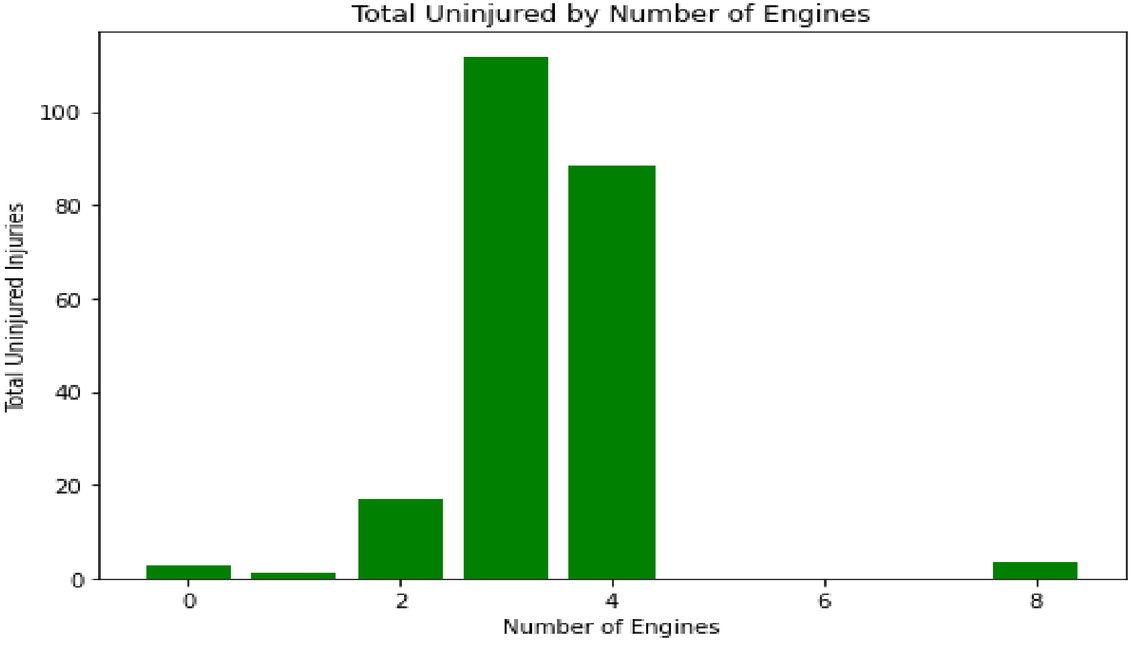
Injured Passengers by Number of Engines in a Plane

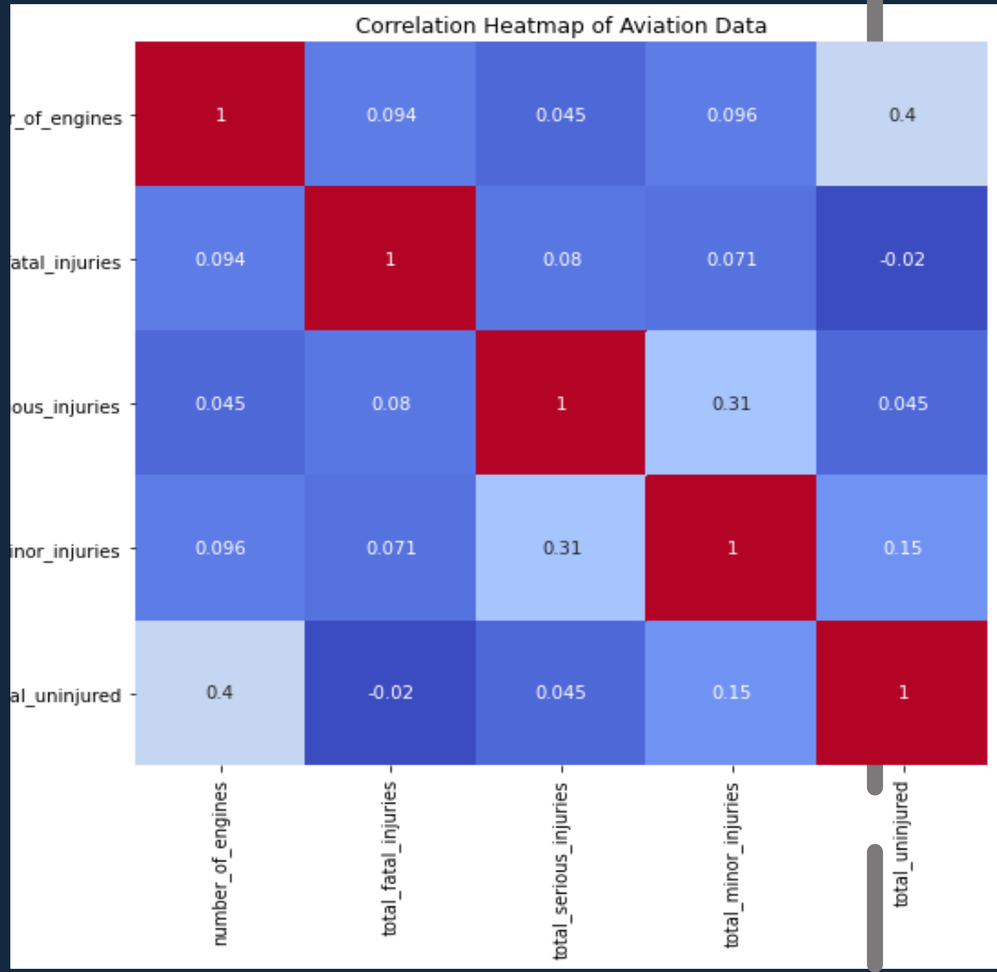
- Planes with 4 engines have the most fatal injuries.
- Plane with 8 engines have the most serious injuries.
- Planes with 3 engines have the most minor injuries and uninjured.
- However, I do not think the number of engines in a plane affects the number of injured/ uninjured. Let's find the correlation between the number of engines and the injuries/ uninjured.


Total Fatal Injuries by Number of Engines
Total Fatal Injuries
Number of Engines
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
0
2
4
6
8


Total Serious Injuries by Number of Engines
Total Serious Injuries
Number of Engines
0
1
2
3
4
5
6
7
0
2
4
6
8

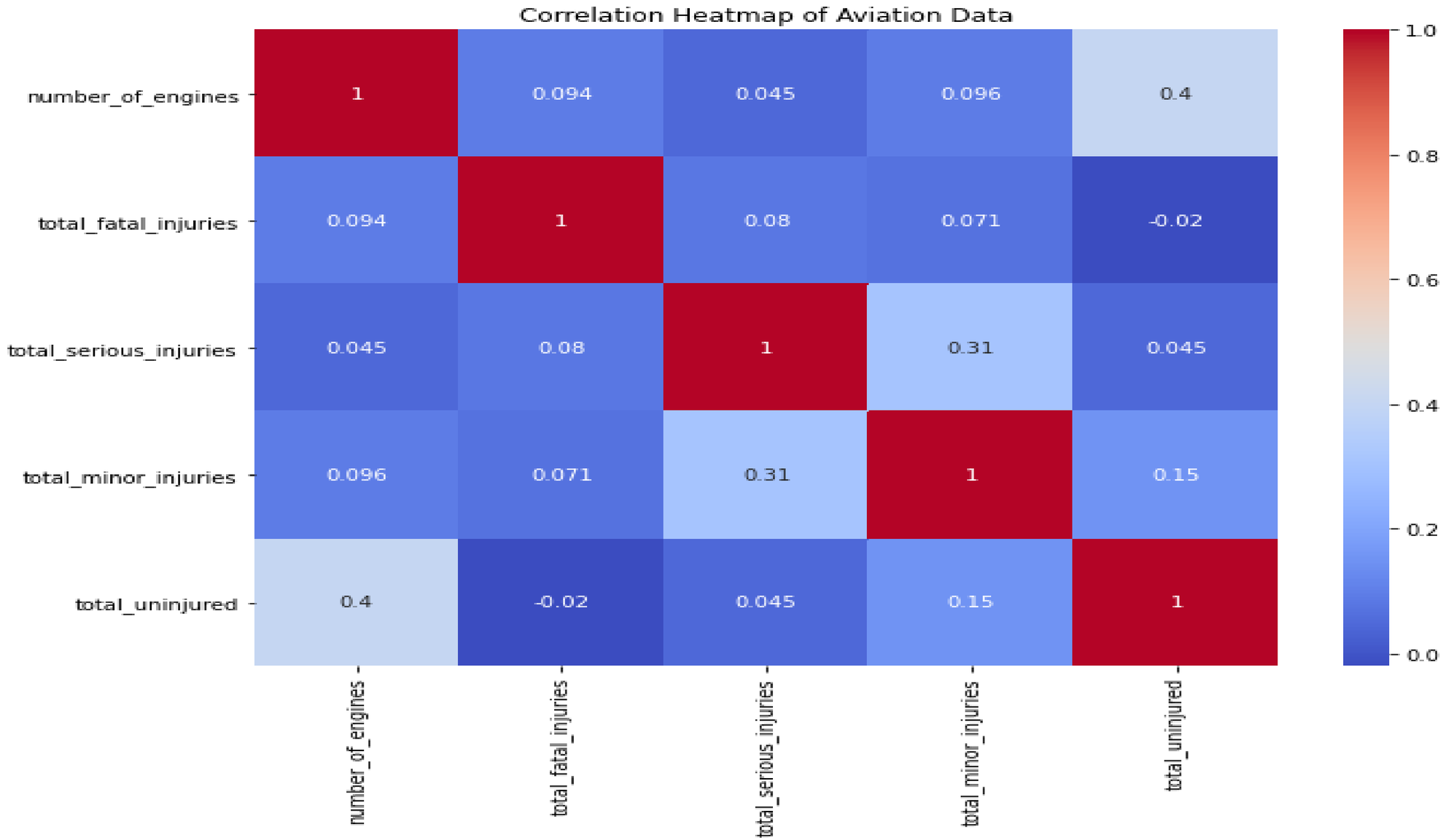

Total Minor Injuries by Number of Engines
Total Minor Injuries
Number of Engines
0.0
0.5
1.0
1.5
2.0
2.5
0
2
4
6
8


Total Uninjured by Number of Engines
Total Uninjured Injuries
Number of Engines
0
20
40
60
80
100
0
2
4
6
8



Correlation Between Number of Engines and Injuries/ Uninjured

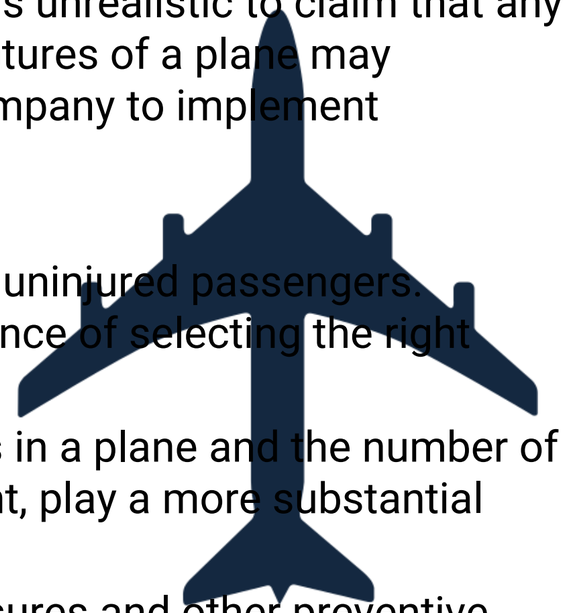
- Upon examining the heatmap, the highest correlation coefficient, apart from 1, is 0.4, indicating a weak positive correlation between certain variables. The lowest correlation is -0.02, representing a very weak negative correlation.
- Notably, when focusing on the number of engines column, its correlation with other variables is consistently below 0.1. This suggests that the number of engines does not have a significant relationship with the number of injuries or uninjured passengers. Therefore, it cannot be concluded that the number of engines in an aircraft directly affects the severity of injuries or the likelihood of passengers being uninjured.
- This observation reinforces the idea that other factors, such as aircraft model, make, and engine type, are more influential in determining injury outcomes, rather than the number of engines alone.


Correlation Heatmap of Aviation Data
number_of_engines
total_fatal_injuries
total_serious_injuries
total_minor_injuries
total_uninjured
1
0.094
0.045
0.096
0.4
0.094
1
0.08
0.071
-0.02
0.045
0.08
1
0.31
0.045
0.096
0.071
0.31
1
0.15
0.4
-0.02
0.045
0.15
1
number_of_engines
total_fatal_injuries
total_serious_injuries
total_minor_injuries
total_uninjured
1.0
0.8
0.6
0.4
0.2
0.0

CONCLUSION

Conclusion

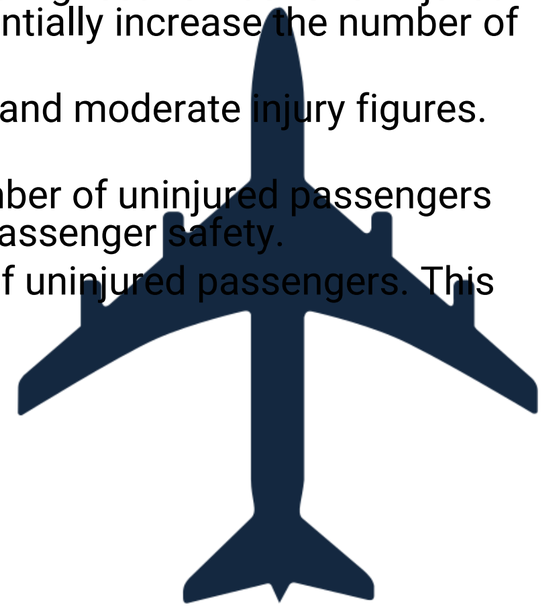
- Accidents are an unfortunate reality in aviation, and while some may be preventable, it's unrealistic to claim that any aircraft can be entirely accident-proof. Factors such as the make, model, and other features of a plane may influence the likelihood and severity of accidents, but it is equally important for the company to implement additional safety measures to minimize risk.
- Based on the analysis, the following conclusions can be drawn:
- **Model, Make, and Engine Type**: These factors do influence the number of injuries and uninjured passengers. Different aircraft characteristics can impact safety outcomes, highlighting the importance of selecting the right combinations for better risk management.
- **Number of Engines**: There is no significant correlation between the number of engines in a plane and the number of injuries or uninjured passengers. This suggests that other factors, beyond engine count, play a more substantial role in influencing safety outcomes.
- These insights emphasize that while aircraft specifications are important, safety measures and other preventive strategies should also be prioritized by the company.



RECOMMENDATIONS

Recommendations

- I would suggest the company consider the following points:
- **Aircraft Model**: Consider the model 737. While it has a high number of fatalities, it also reports the highest number of uninjured passengers. By implementing additional safety measures, it's possible to reduce injuries and potentially increase the number of uninjured passengers.
- **Aircraft Make**: Boeing emerges as the safest option, with a high number of uninjured passengers and moderate injury figures. This make demonstrates strong safety performance overall.
- **Professionally Built Planes**: Opt for professionally built aircraft, as they tend to have a higher number of uninjured passengers compared to amateur-built planes, highlighting the benefits of expert craftsmanship in ensuring passenger safety.
- **Engine Type**: A turbojet engine should be prioritized, as it is associated with the highest number of uninjured passengers. This engine type offers a safer profile in terms of passenger injury outcomes.
- If interested in several options, consider the following makes:
- Boeing
- Mcdonnel
- Douglas
- Piper
- Airbus
- These recommendations aim to optimize safety by focusing on proven models, makes, and engineering standards.



AOBs