ANALYSIS ON AIRCRAFT DATA TO DETERMINE THE SAFEST AIRCRAFT

Overview

- **Objective**: To assess the risks associated with different aircraft makes, focusing on accident severity, damage, and other factors, in order to help the company decide which aircraft to purchase for its new aviation business.

- **Outcome**: Provide actionable insights that will help minimize potential risks in aircraft selection and improve safety for commercial and private enterprises.

Business Understanding

Business Problem:

- The company needs decide which aircraft to purchase for both commercial and private enterprises.

- The focus is on determining which aircraft are the lowest risk for the company to purchase. The analysis will translate findings into actionable insights for the head of the new aviation division.

Business Understanding

•**Key Questions**:

1.Which aircraft are the least risky in terms of injury severity and damage?

2.What factors (e.g., weather, engine type) contribute most to accident severity?

3.How can the company mitigate risk when selecting aircraft for purchase?

Business Understanding

Stakeholders:

• Head of Aviation Division

• Risk Management Team

• Executive Leadership (for strategic decision-making)

Data Understanding

Dataset Overview:
• The data was from the National Transportation Safety Board.

•It includes aviation accident data from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters.

• We have 13 Variables that will help in answering the Business problem.

Data Understanding

Key Variables:

• Injury Severity

• Aircraft damage

• Make

• Engine Type
•
• Total Injuries

Data Analysis

Checking for Outliers

- We started by checking and removing outliers
- Outliers were present in the following columns:
  - Total Fatal Injuries
  - Total Serious Injuries
  - Total Minor Injuries
  - Total Uninjured
- We then plotted a boxplot of each to confirm removal of outliers

Data Analysis

- **Feature Engineering:**
- Created a new column 'Total Injuries'
- It was the weighted average of the following variables:
  - Total Fatal Injuries
  - Total Serious injuries
  - Total Minor Injuries
- Respective weights were distributed to the three columns based on the impact each has in answering the Business problem at hand.

Data Analysis

Univariate Distributions

- We plotted appropriate Univariate columns for all the variables.
- This resulted in the following conclusions:
  - Most Airplane Accidents happened in the United States
  - Most Airplane accidents are Non-fatal
  - Once Aircraft accidents happen, the aircrafts are substantially destoyed
  - Cessna is the mot common aircraft make
  - Most Aircrafts are not Amateur built.
  - Most Aircrafts have 1 engine
 - Most Aircrafts have reciprocating engine type

Bivariate Distributions

Engine Type Vs Make

Engine Type by Aircraft Manufacturer
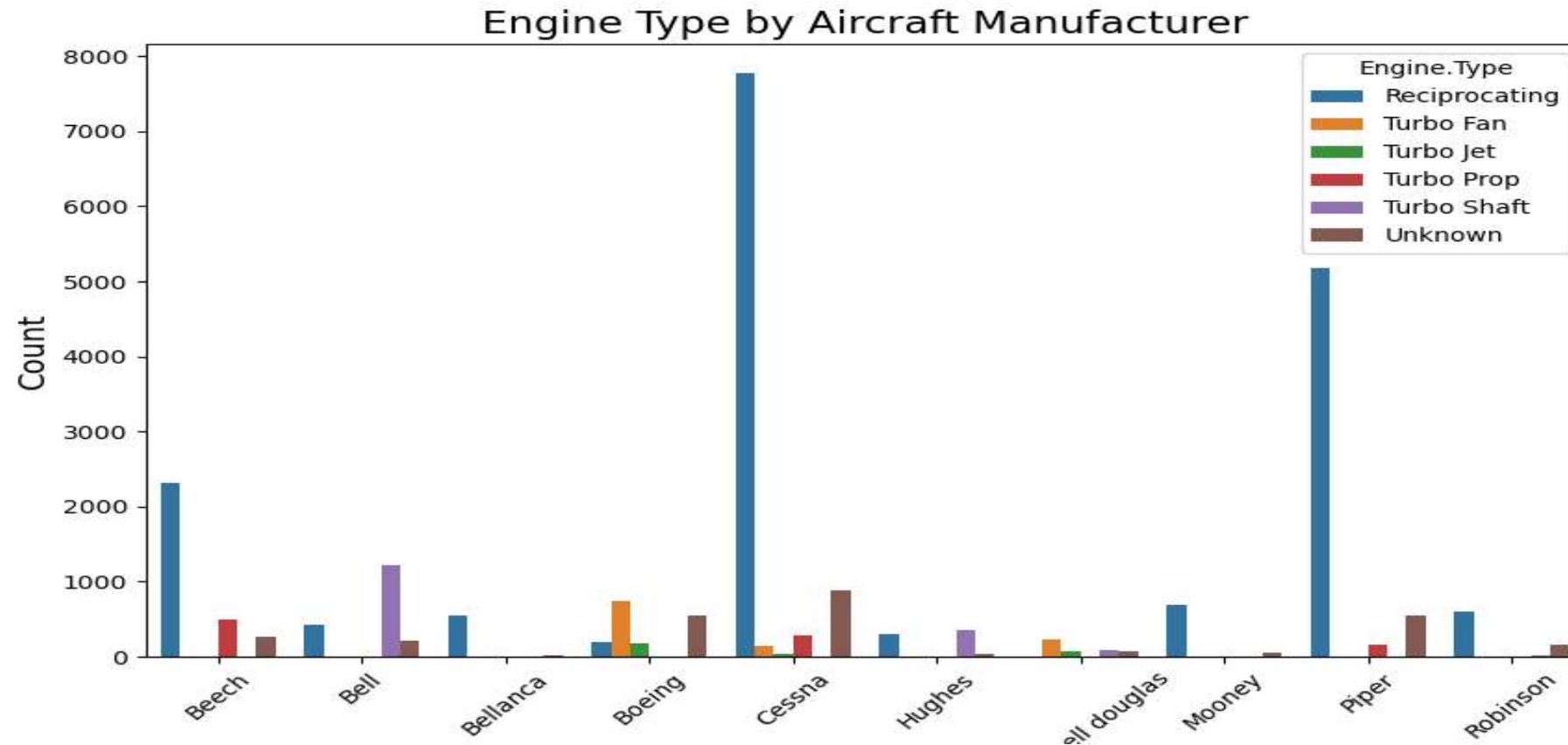
Comments on Engine Type Vs Make

- Cessna, Piper, Beech, Bellanca, Mooney and Robinson mainly manufactures planes with Reciprocating Engine Type.

- Bell and Hughes mainly manufactures planes with Turbo Shaft Engine Type.

- Boeing and Mcdonnell douglas mainly manufactures planes with Turbo Fan Engine Type..

Make vs Aircraft Damage

Aircraft Damage by Manufacturer
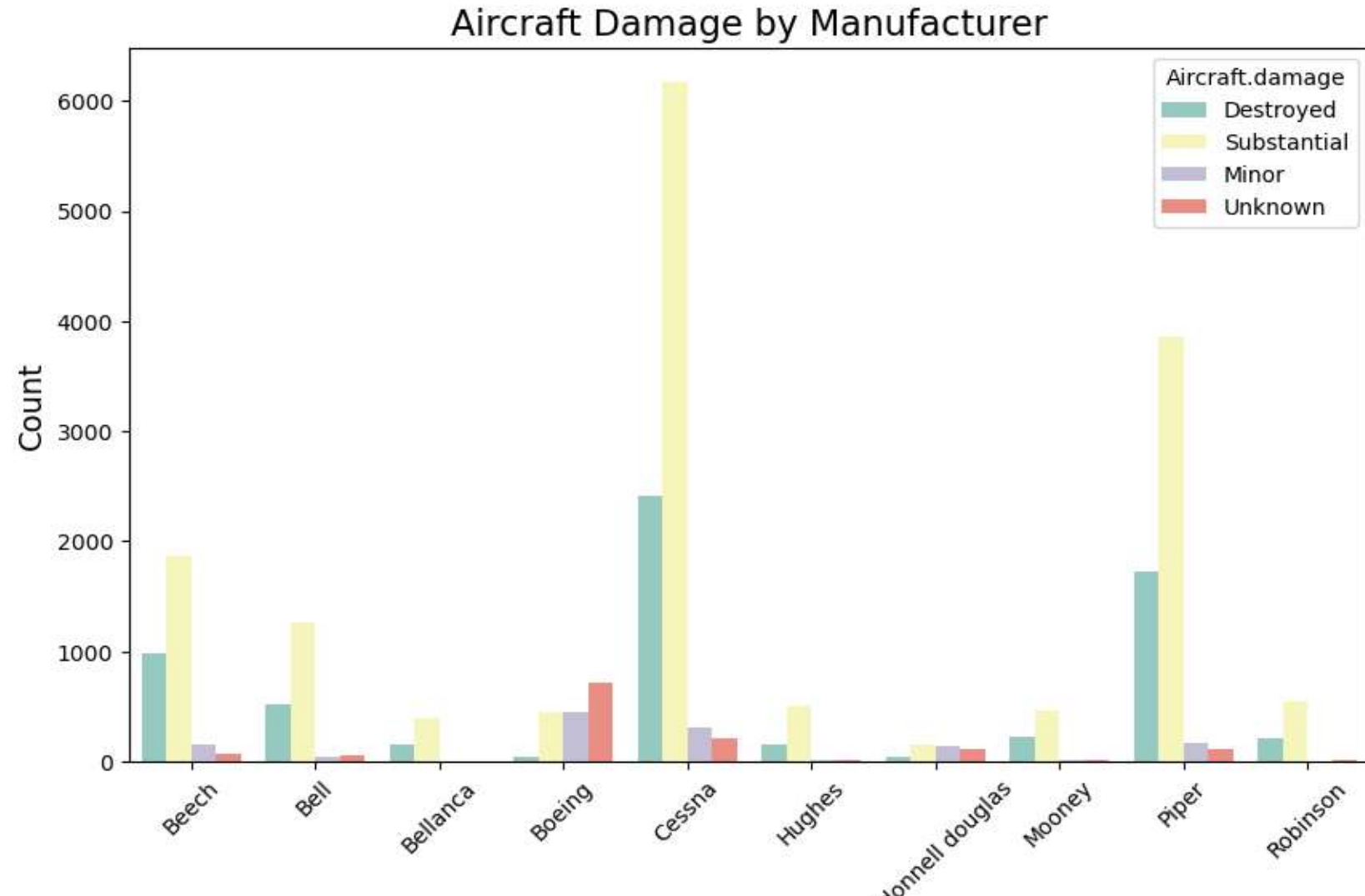
Comments on Make vs Aircraft Damage

- **Beech, Bell, Bellanca, Cessna, Hughes, Mooney , Piper** and **Robinson** Aircraft Makes experienced **Substantial   and 'Destroyed**' damage after an accident.

- **Boeing and Mcdonnel douglas** Aircraft makes experienced **substantial and Minor damage** after an accident

- Based on this outcome Boieng and Mcdonnel douglas are better choice.

Engine Type vs Injury severity

Injury Severity by Engine Type
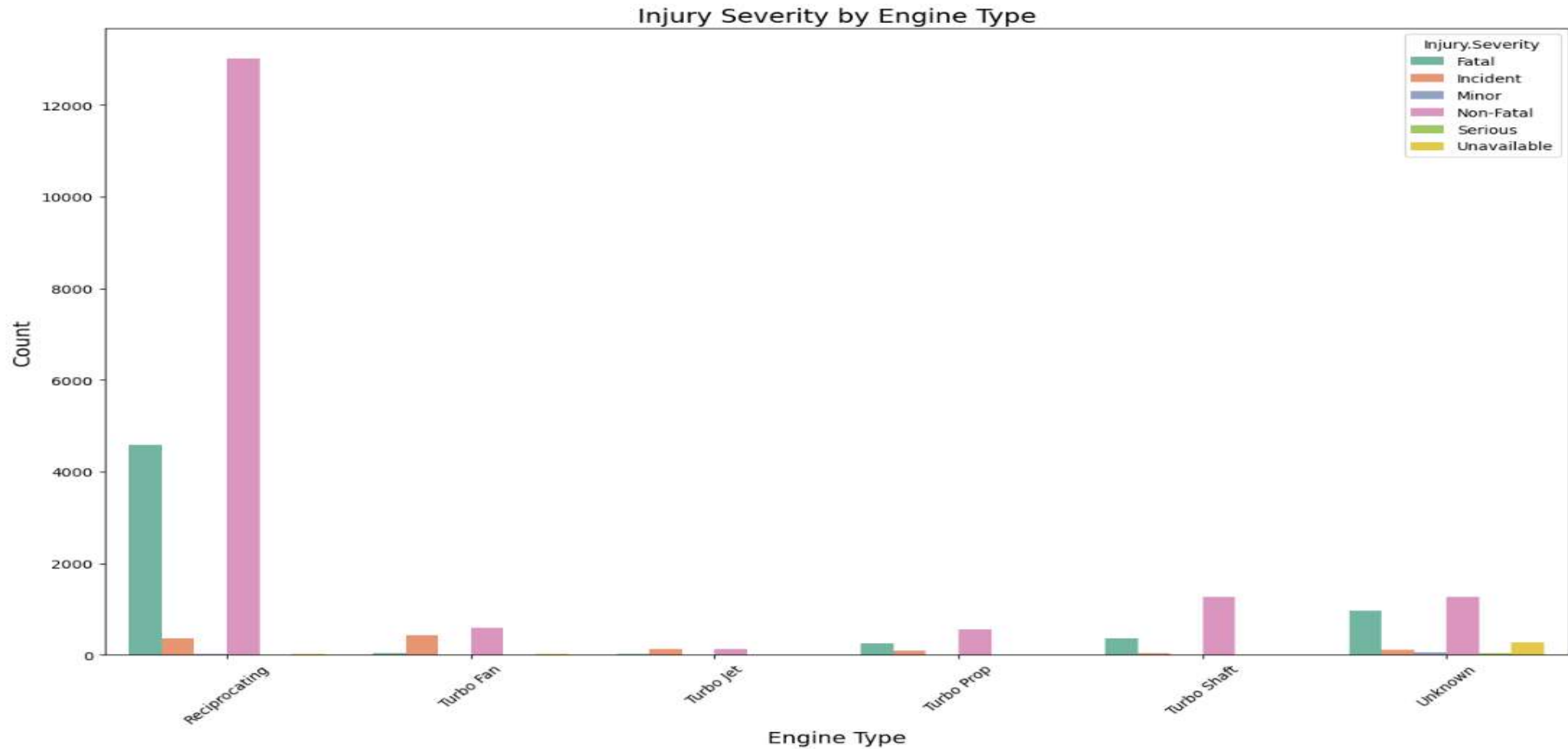
Comments on Engine Type vs Injury Severity

- **Reciprocating, Turbo prop and Turbo Shaft** Engine Types experience **non -fatal and Fatal** Injury Severity.

- **Turbo Fan and Turbo Jet** experience **Non_fatal and Incident** Injury Severity .

- Earlier on we deduced that Boeing and Mcdonnel douglas Aircrafts majorly have Turbo Fan Engine Types.

- We have now deduced that the Turbo Fan Engine Type has Non Fatal and Incident Injury Severity.

Make Vs Total Fatal Injuries
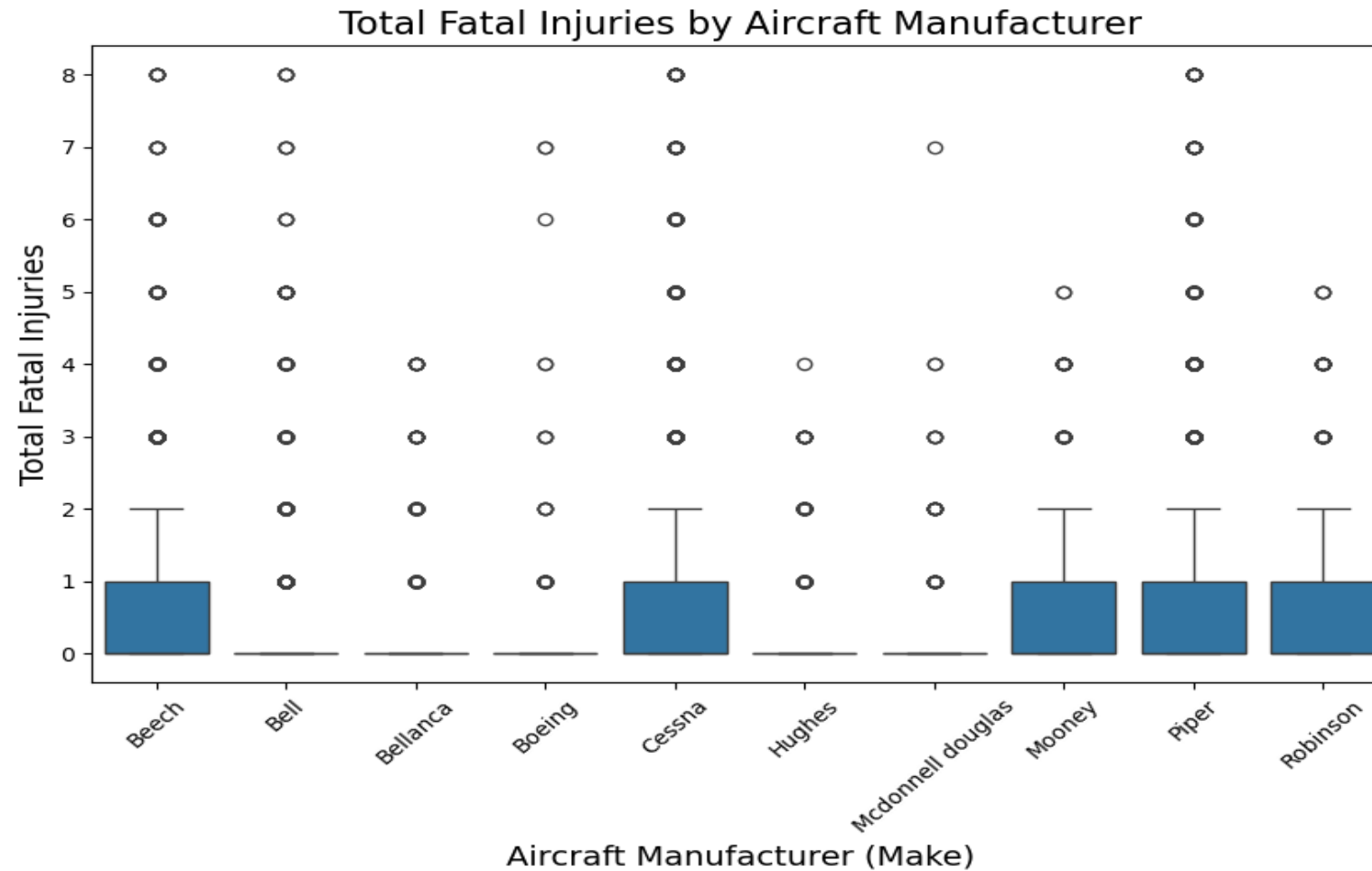
Comments on Make vs Total Injuries

- Group A: (Beech, Cessna, Mooney, Piper and RObinson Aircraft Makes) experienced hugely total fatal injuries of 0-1

- Group B: (Bell, Bellanca, Boeing Hughes and Mcdonnell douglas Aircraft makes) experienced total fatal injuries of 0.

- Therefore Group B is safer than group A

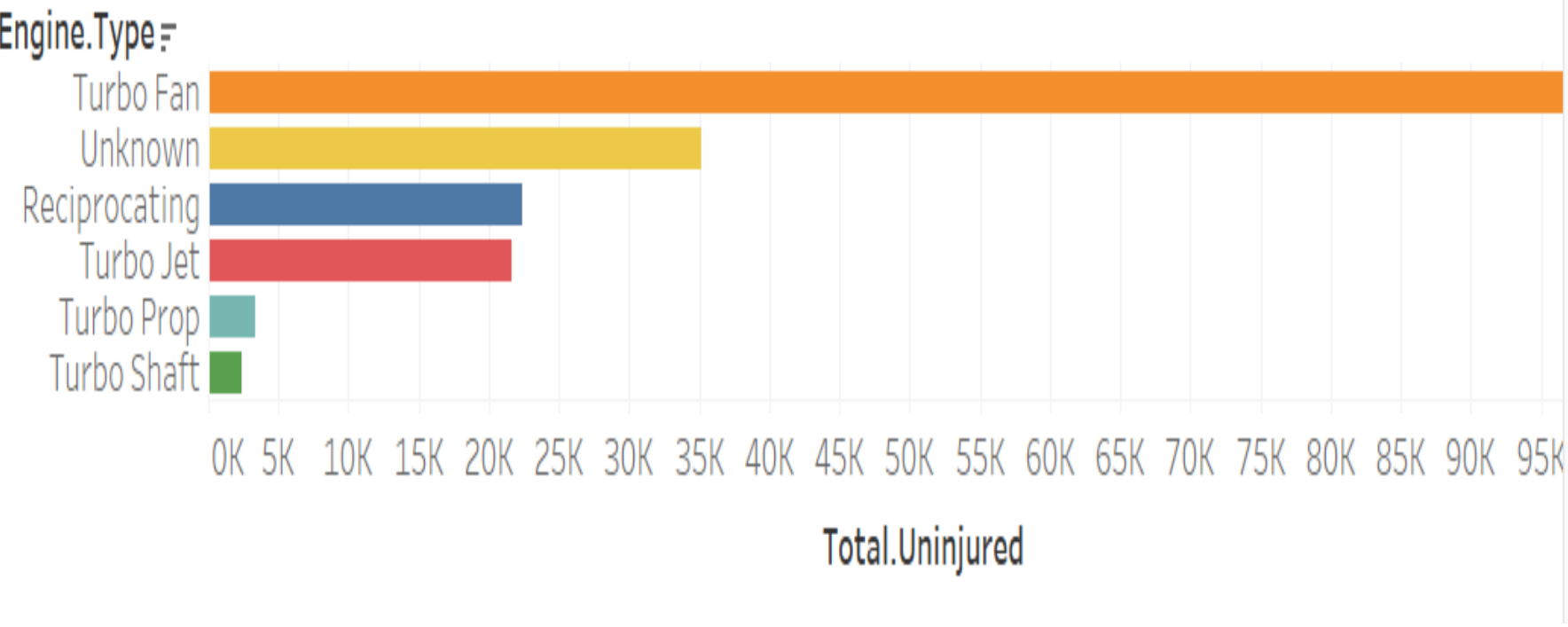# Total Uninjured vs Make

Passenger Safety by Make
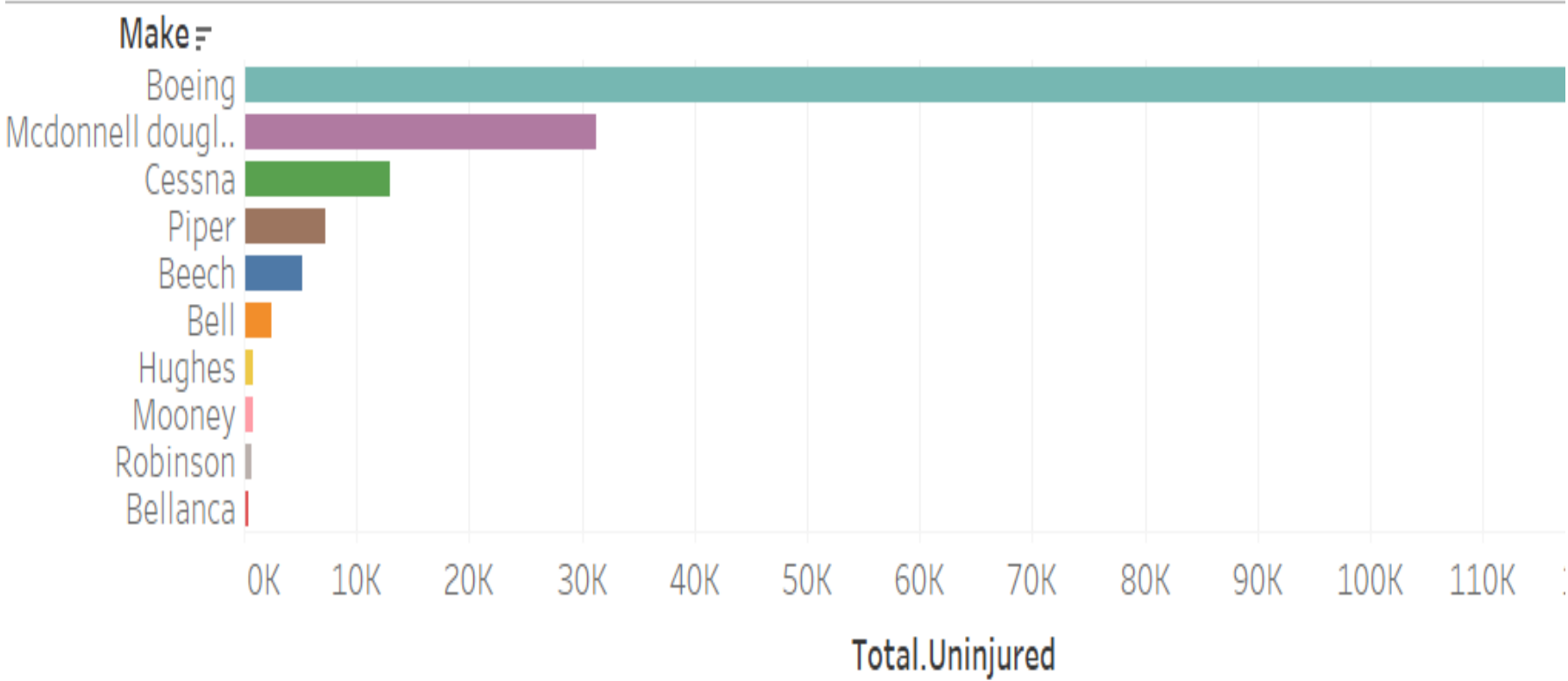
Comments on Total Uninjured vs Make

- Boeing Aircraft make is the safest

Total Unijured vs Engine Type

Passenger Safety by Engine Type

Engine.Type

Engine Type	
Turbo Fan	(orange bar, ~95K)
Unknown	(yellow bar, ~35K)
Reciprocating	(blue bar, ~22K)
Turbo Jet	(red bar, ~21K)
Turbo Prop	(teal bar, ~3K)
Turbo Shaft	(green bar, ~2K)

0K 5K 10K 15K 20K 25K 30K 35K 40K 45K 50K 55K 60K 65K 70K 75K 80K 85K 90K 95K
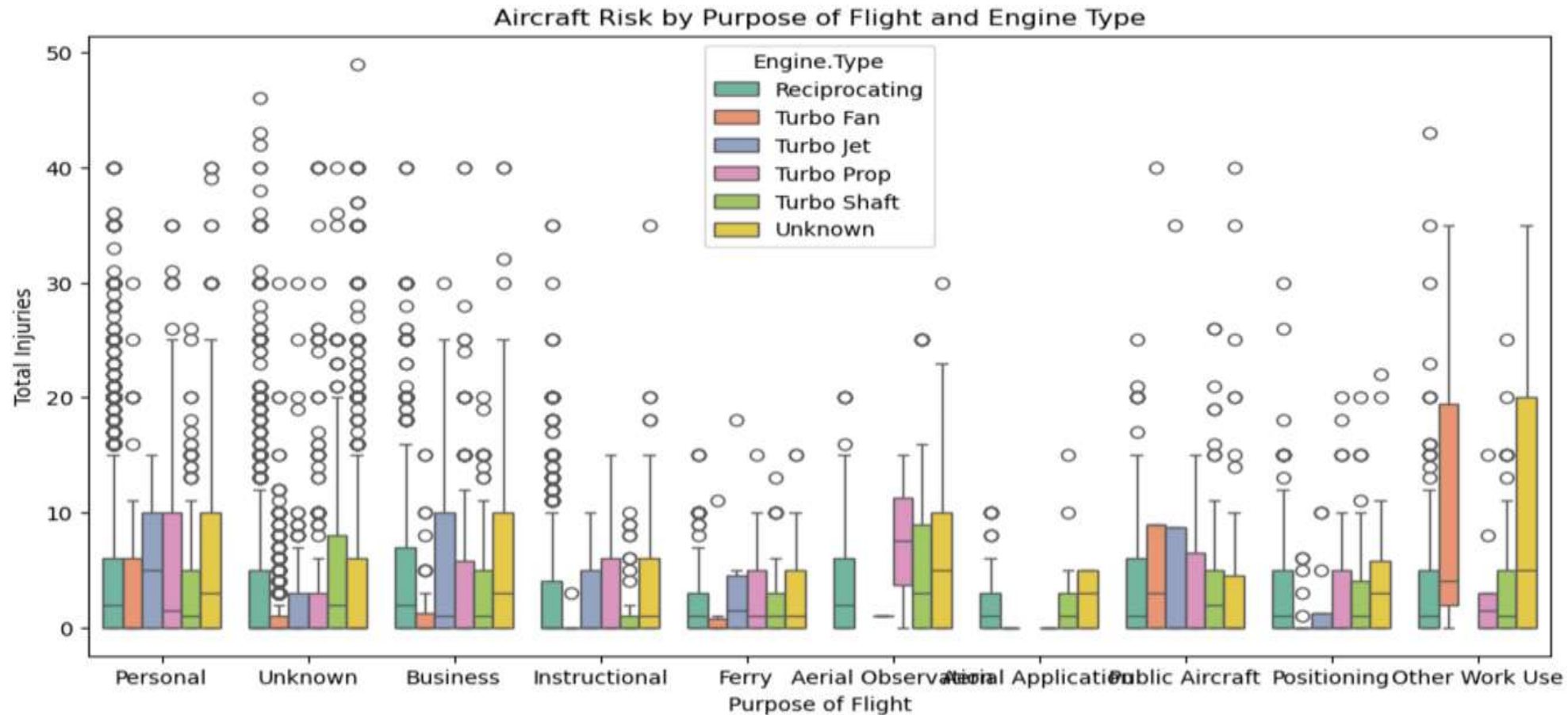
Total.Uninjured

Comments on Total Unijured vs Engine Type

- Turbo fan engine types are the safest

Multivariate Distributions
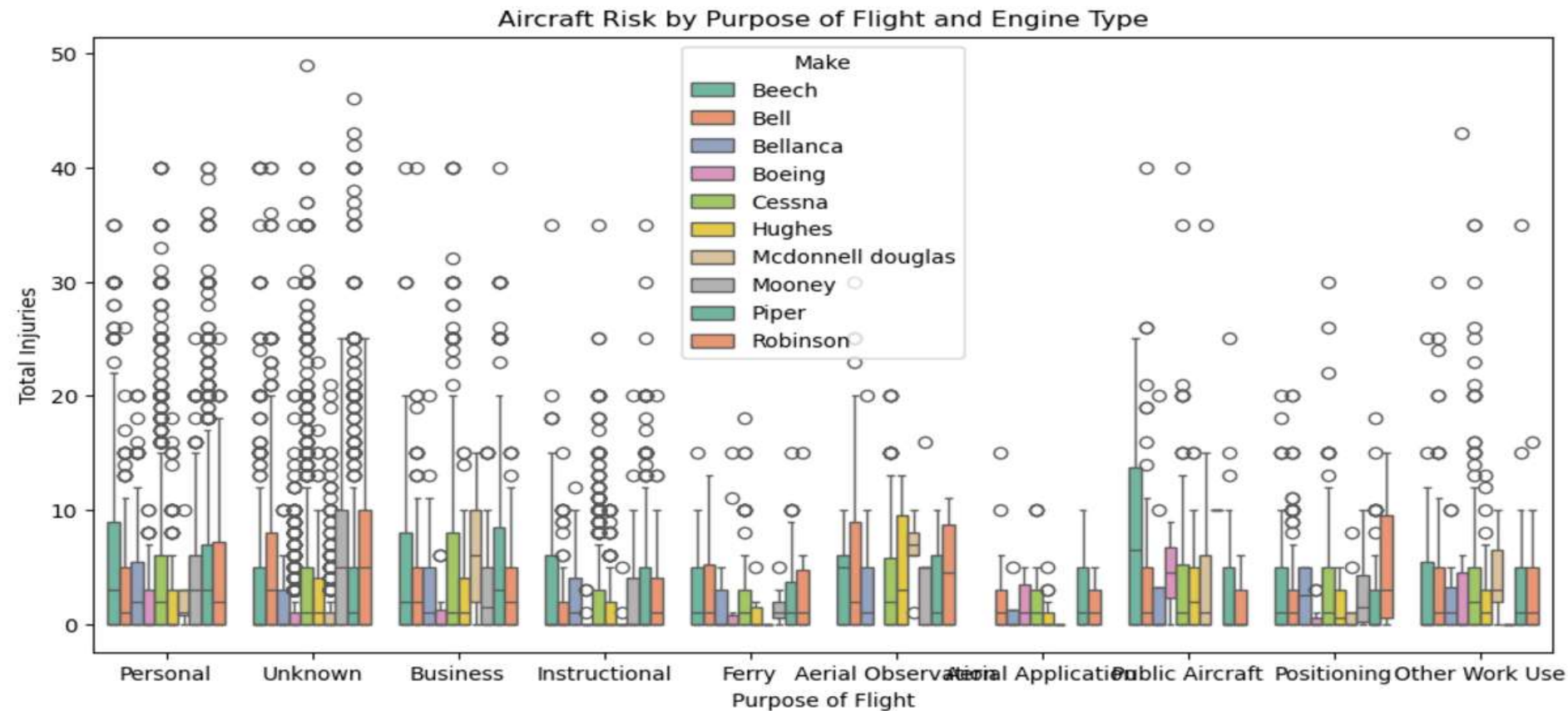## Total Injuries by Purpose of Flight and Engine Type

Aircraft Risk by Purpose of Flight and Engine Type

Comments on Total Injuries by Purpose of Flight and Engine Type

- The company is interested in Aircrafts for commercial and Private purposes.

- Therefore we will concentrate on Personal and Business Values from our plot

- For Personal use Aircrafts with Turbo shaft Engine type experienced lesser Total Injuries.

- For Business use, Aircrafts with Turbo Fan experienced lesser Total Injuries on average.

- It will be less risky for the company to choose a plane with either of the engine type

Multivariate Analysis of Aircraft Risk by Purpose of Flight and Make

Aircraft Risk by Purpose of Flight and Engine Type

Comments on Multivariate Analysis of Total Injuries by Purpose of Flight and Make

- For Personal use , Boeing and Hughes experienced lesser Total injuries on average.

- For Business use, Boeing experienced lesser Total injuries on average.

Conclusions

- Boeing Airplane make performed better in most of the critical variables that were helping in answering the Business problem

Ie. Engine Type, Total Injuries and Purpose of Use.

Recommendation

- The company should buy an Aircraft with Turbo Fan Engine Type.
- The company should purchase a Boeing Aircraft