Phase 1 Project.

Aviation Risk Analysis.

Objectives:

- Identify the safest aircraft for purchase.
- Analyze key risk factors related to incidents.
- Provide actionable recommendations for safe and efficient operations.

Overview.

- **Company Expansion Goal**:

To diversify the company's portfolio by entering the aviation sector with a focus on purchase and operation of airplanes for commercial and private enterprises.

- **Key Challenges:**
  - Limited knowledge of risks in aviation.
  - Need for data-driven insights to identify safe and reliable aircraft

Data Overview.

The dataset used is from the National Transportation Safety Board including aviation accident data about civil aviation accidents from 1962 to 2023. Key features of the dataset include:

- Aircraft Information:
  - Make and model.
  - Flight Purpose.
- Incident details:
  - Total number of incidents
  - Broad phase of flight.
- Injury and Fatality Data.
- Timeframe.

Data Analysis.

Methods:

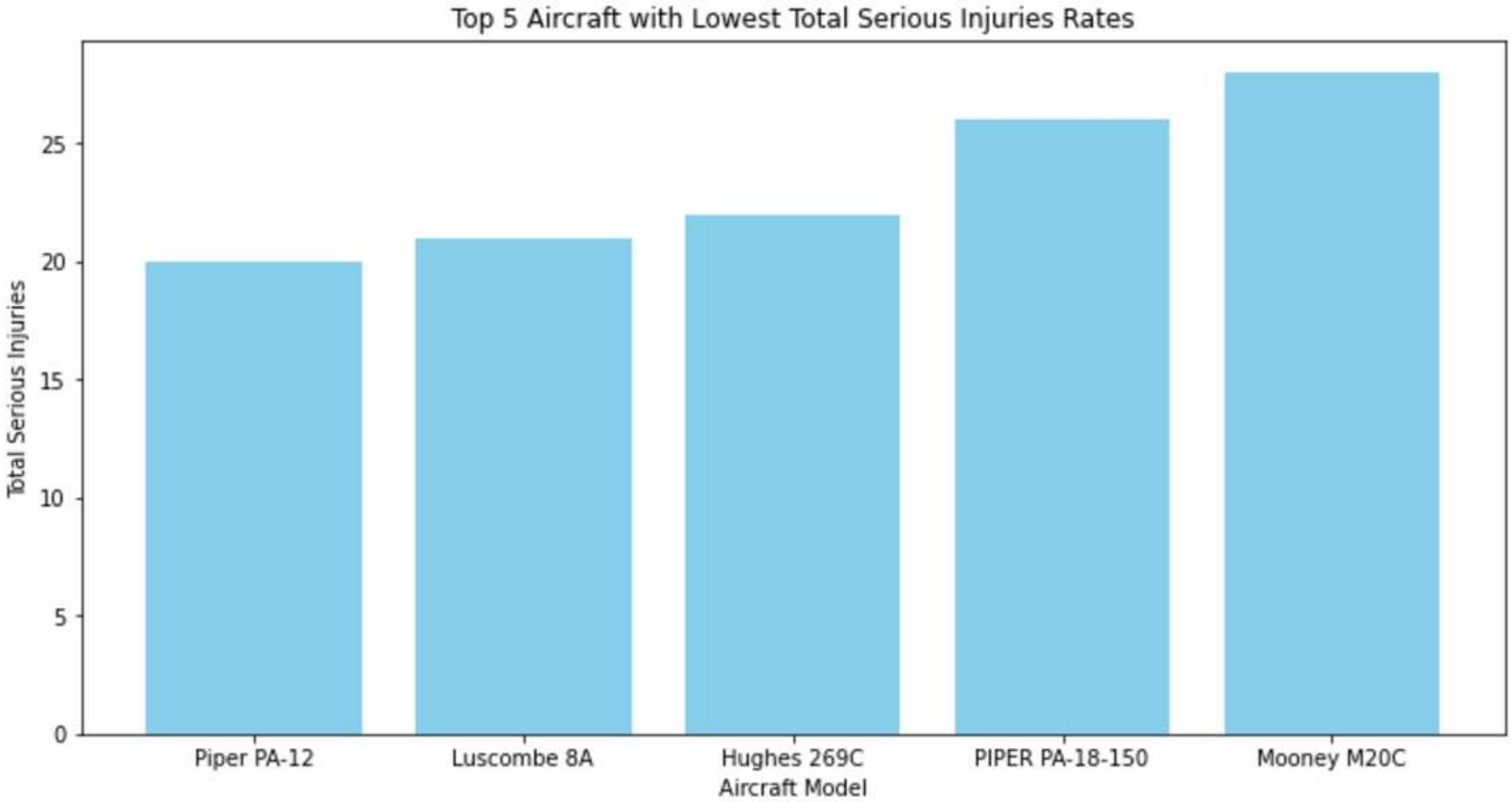
- Data cleaning and preparation(handling missing values, filtering relevant data)
- Key analyses performed:
  - Aggregating aircraft by Make/Model.
  - Risk assessment using fatality and injury rates.
  - Risk assessment using environmental and operational variables.
  - Analyzing the trend in fatalities over time.

Findings.

Safest Aircraft Models

To find the safest aircraft models, the risk metric considered was Total Serious Injuries for each model. The fatality rate was not used since the top safest aircraft all had a fatality rate of 0. The top 5 aircraft with the lowest Total Serious Injuries rates were:

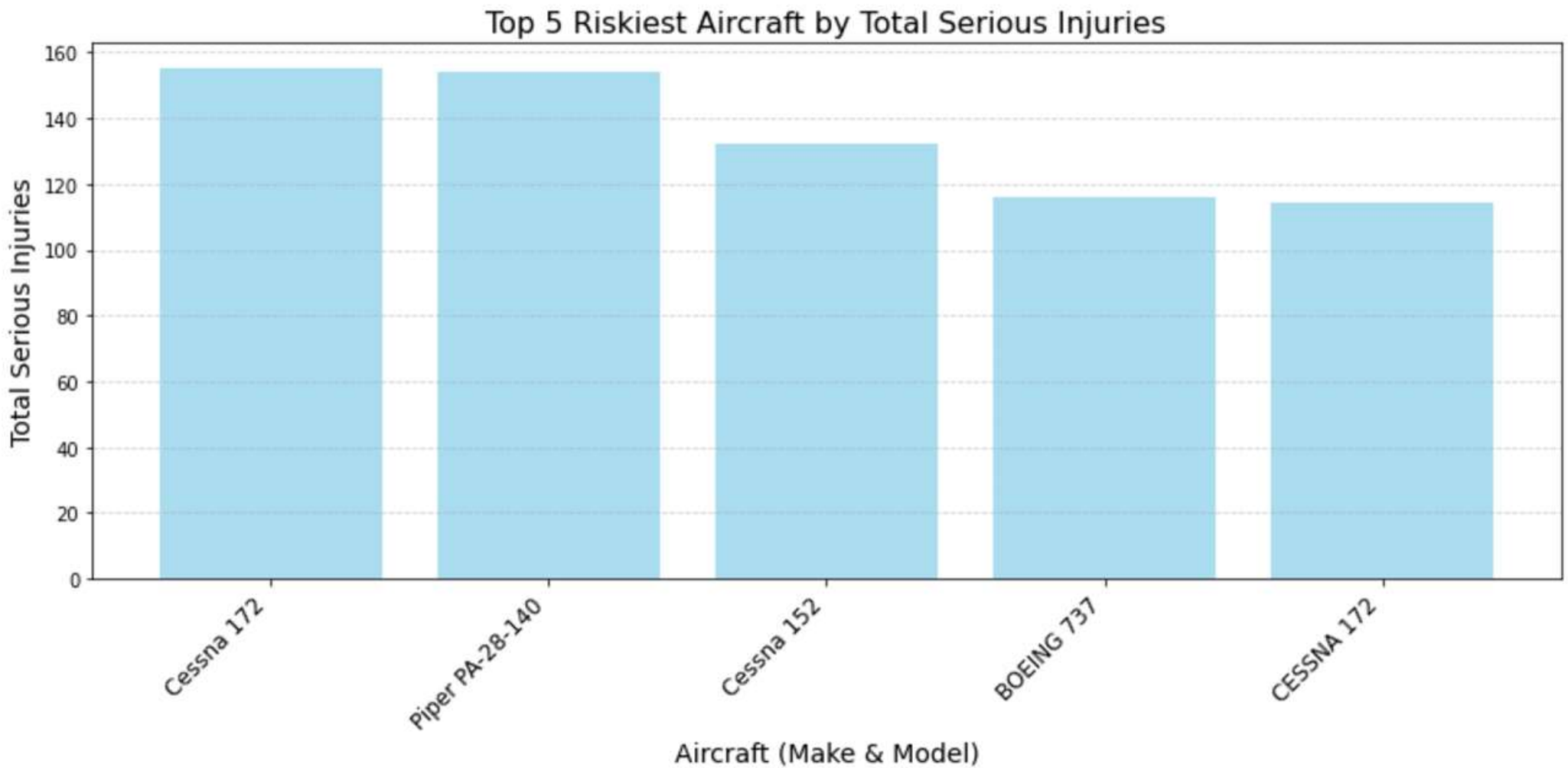
- Piper PA-12.
- Luscombe 8A.
- Hughes 269 Aircraft Model.
- Piper PA-18-150.
- Mooney M20C.


Top 5 Aircraft with Lowest Total Serious Injuries Rates
Total Serious Injuries
0
5
10
15
20
25
Piper PA-12
Luscombe 8A
Hughes 269C
PIPER PA-18-150
Mooney M20C
Aircraft Model

Riskiest Aircraft Models.

The same was done to find the riskiest aircraft models. The top 5 aircraft with the highest Total Serious Injuries were:

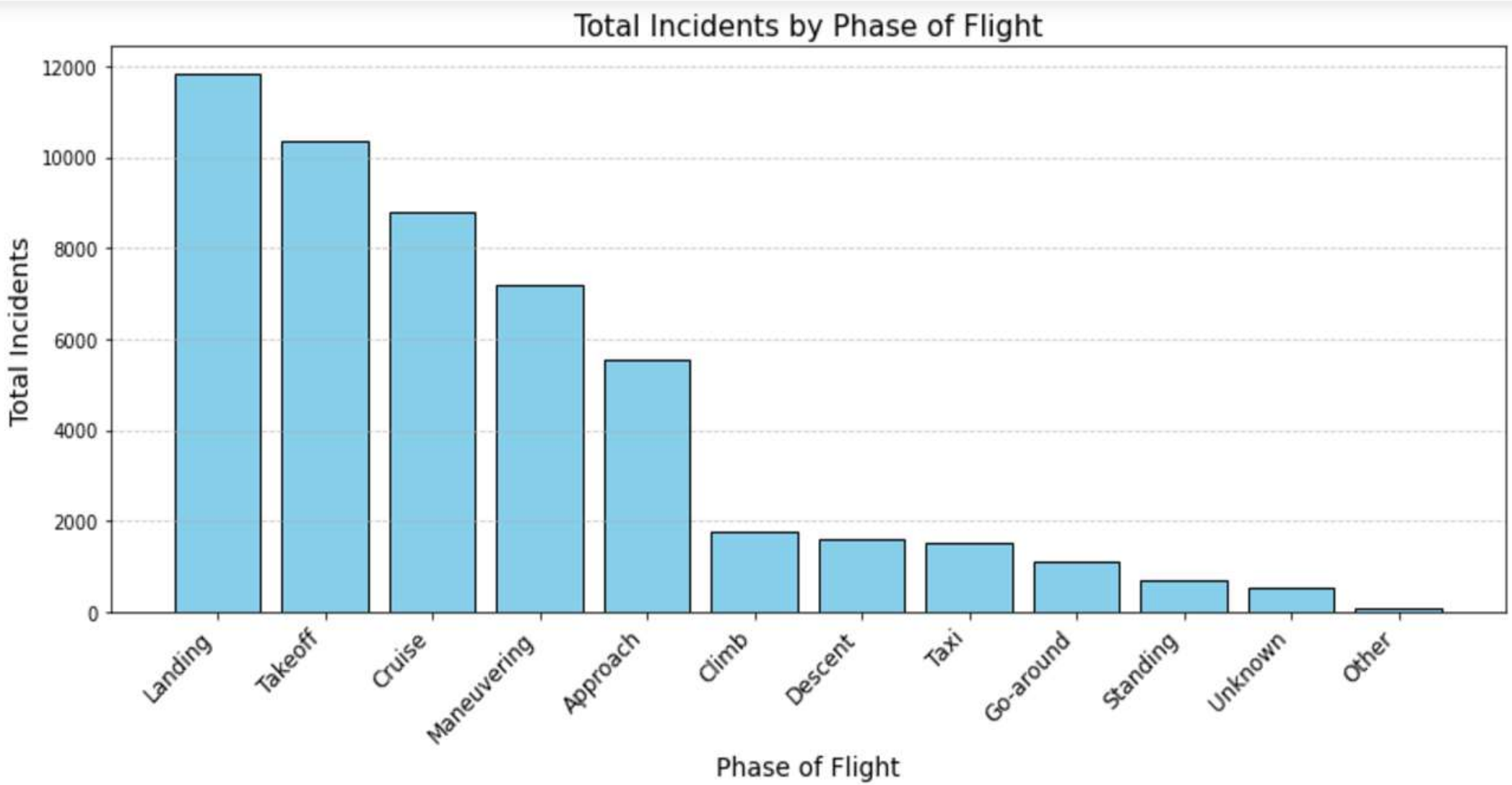
- Cessna 172.
- Piper Pa-28-140.
- Cessna 152.
- Boeing 737.
- Cessna 172N


Top 5 Riskiest Aircraft by Total Serious Injuries
Total Serious Injuries
0
20
40
60
80
100
120
140
160
Cessna 172
Piper PA-28-140
Cessna 152
BOEING 737
CESSNA 172
Aircraft (Make & Model)

Risk by Flight Phase.

To determine the risk for every flight phase, the total number of incidents at each phase of flight was determined and arranged from the highest risk to lowest risk. The top 5 highest risk phases of flight were:

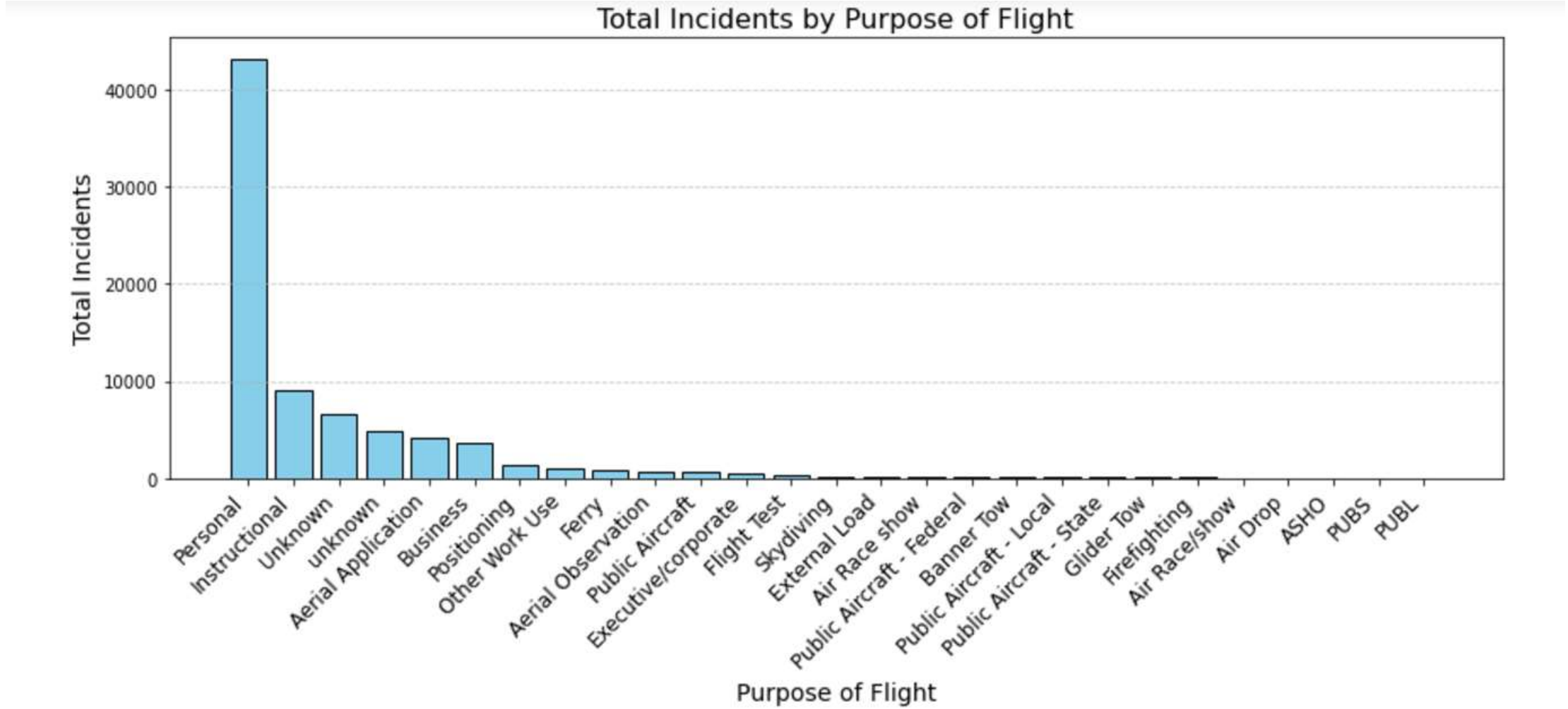
- Landing.
- Takeoff.
- Cruise.
- Maneuvering.
- Approach.


Total Incidents by Phase of Flight
Total Incidents
12000
10000
8000
6000
4000
2000
0
Landing
Takeoff
Cruise
Maneuvering
Approach
Climb
Descent
Taxi
Go-around
Standing
Unknown
Other
Phase of Flight

Incidents by Purpose of flight.

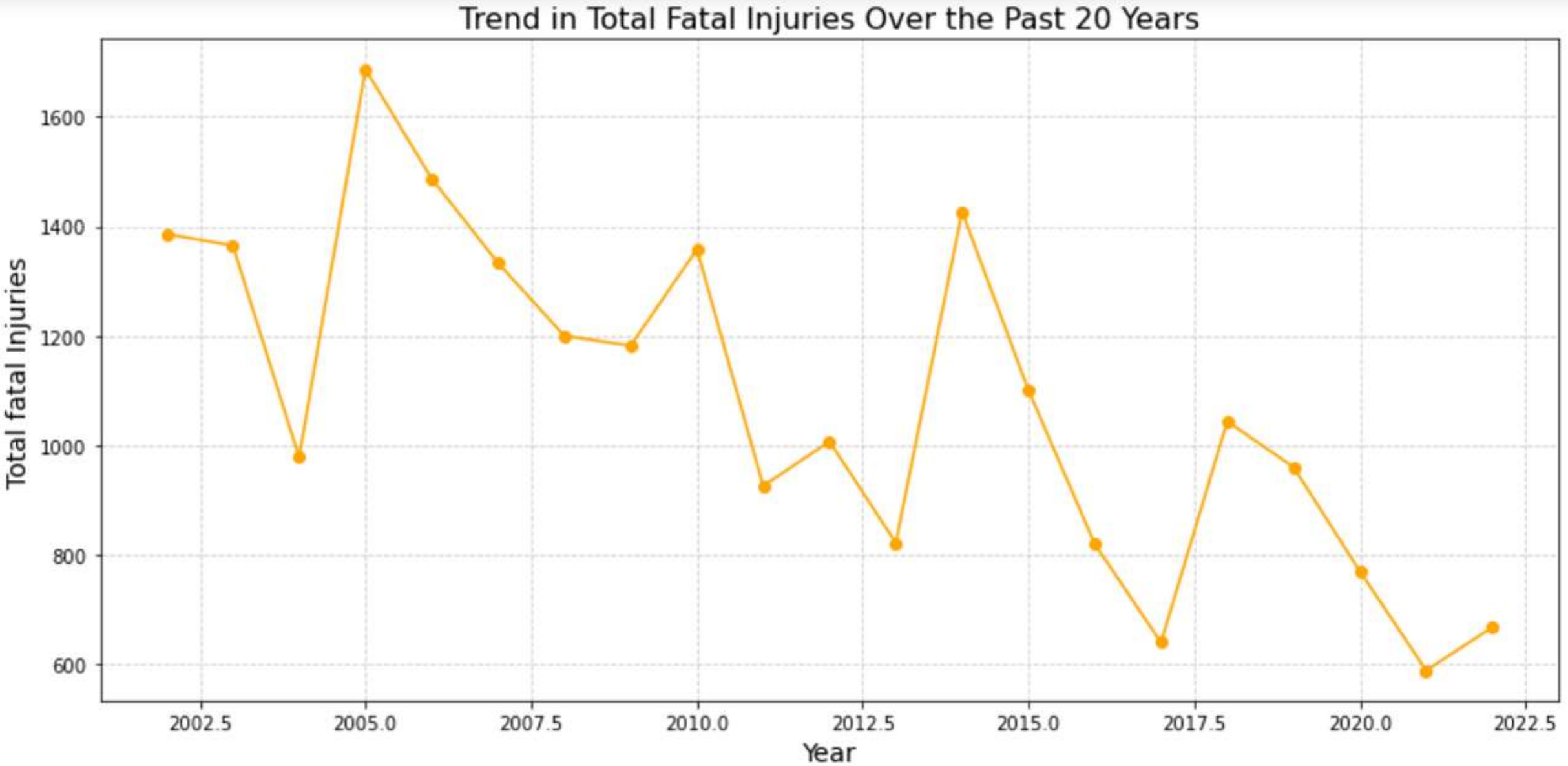
The purpose of each flight in the dataset was also taken into consideration and an analysis of the total incidents by purpose of flight revealed the ones with the highest risk to be:

- Personal.
- Instructional.
- Aerial Application.


Total Incidents by Purpose of Flight
Total Incidents
40000
30000
20000
10000
0
Personal
Instructional
Unknown
unknown
Aerial Application
Business
Positioning
Other Work Use
Ferry
Aerial Observation
Public Aircraft
Executive/corporate
Flight Test
Skydiving
External Load
Air Race show
Public Aircraft - Federal
Banner Tow
Public Aircraft - Local
Public Aircraft - State
Glider Tow
Firefighting
Air Race/show
Air Drop
ASHO
PUBS
PUBL
Purpose of Flight

Trend in fatalities over time.

To find out whether air travel has gotten safer or riskier, a chart was plotted detailing the Total Fatal Injuries for each year for the past 20 years.


Trend in Total Fatal Injuries Over the Past 20 Years
Total fatal Injuries
1600
1400
1200
1000
800
600
2002.5
2005.0
2007.5
2010.0
2012.5
2015.0
2017.5
2020.0
2022.5
Year

Business Recommendations.

- Aircraft Purchase:

Prioritize the top 5 safest aircraft models and avoid the top 5 riskiest ones.

- Focus on risky phases:

Implement enhanced safety protocols during the landing and takeoff phases of flight.

- Purpose of flight:

Avoid venturing into risky ones such as personal flights and start with less risky ones such as Business and public aircraft purposes.

Next steps.

- Finalize aircraft procurement based on findings.
- Develop safety initiatives targeting high-risk scenarios.
- Plan operational training and risk mitigation strategies.

Thank You.

Thank you for your time and attention.

Contact Information:

Name: Justin Mbugua.

LinkedIn: Justin Mbugua.

Please feel free to reach out with any questions or for further details.