Final Project Submission

Please fill out:

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- Student pace: Full Time Hybrid
- Scheduled project review date/time: N/A
- Instructor name: Mr. Antonny Muiko

Naviar Corporation Aircraft Project Analysis

Company Logo

Overview

Naviar Corporation is a company that rents and sells luxury vehicles and offers chauffeuring services. However, the company has decided to venture into the aircraft industry where it would be purchasing and operating airplanes for commercial and private enterprises.

In this project, the public dataset from the National Transportation Safety Board will be used to determine the aircrafts that have the least amount of risks.

Business Understanding

Private Jet

Naviar Corporation requires a risk-free set of commercial and private aircraft in order to avoid casualties and financial losses which might damage the business. I am responsible for analyzing data/findings and developing insights and recommendations that will help the head of the new aviation division decide which aircraft to purchase.

Data Understanding

The aviation accident data (1962-2023) from the National Transportation Safety Board highlights the civil aviation accidents and selected incidents in the United States and international waters. In this case, there would be statistics about the plane descriptions, type of accidents and the number of fatalities/injuries sustained during the accident.

The Event ID is the unique identifier. I need to get the description of the dataset in order to know the data structure and data types in order to clean the data.

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline
```

```
df = pd.read_csv('./data/Aviation_Data.csv')

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 90348 entries, 0 to 90347
Data columns (total 31 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   Event.Id                88889 non-null  object
 1   Investigation.Type      90348 non-null  object
 2   Accident.Number         88889 non-null  object
 3   Event.Date              88889 non-null  object
 4   Location                88837 non-null  object
 5   Country                 88663 non-null  object
 6   Latitude                34382 non-null  object
 7   Longitude               34373 non-null  object
 8   Airport.Code            50132 non-null  object
 9   Airport.Name            52704 non-null  object
 10  Injury.Severity         87889 non-null  object
 11  Aircraft.damage         85695 non-null  object
 12  Aircraft.Category       32287 non-null  object
 13  Registration.Number     87507 non-null  object
 14  Make                    88826 non-null  object
 15  Model                   88797 non-null  object
 16  Amateur.Built           88787 non-null  object
 17  Number.of.Engines       82805 non-null  float64
 18  Engine.Type             81793 non-null  object
 19  FAR.Description         32023 non-null  object
 20  Schedule                12582 non-null  object
 21  Purpose.of.flight       82697 non-null  object
 22  Air.carrier             16648 non-null  object
 23  Total.Fatal.Injuries    77488 non-null  float64
 24  Total.Serious.Injuries  76379 non-null  float64
 25  Total.Minor.Injuries    76956 non-null  float64
 26  Total.Uninjured         82977 non-null  float64
 27  Weather.Condition       84397 non-null  object
 28  Broad.phase.of.flight   61724 non-null  object
 29  Report.Status           82505 non-null  object
 30  Publication.Date        73659 non-null  object
dtypes: float64(5), object(26)
memory usage: 21.4+ MB

C:\Users\PHIL CONRAD\AppData\Local\Temp\ipykernel_9360\222585957.py:1:
DtypeWarning: Columns (6,7,28) have mixed types. Specify dtype option
on import or set low_memory=False.
  df = pd.read_csv('./data/Aviation_Data.csv')
```

There seems to be a lot of null values in many of the columns. We then have to figure out the outlook of the 1st 10 rows and the last 10 rows.

```
df.head(10)
```

```
         Event.Id Investigation.Type Accident.Number  Event.Date  \
0  20001218X45444           Accident      SEA87LA080  1948-10-24
1  20001218X45447           Accident      LAX94LA336  1962-07-19
2  20061025X01555           Accident      NYC07LA005  1974-08-30
3  20001218X45448           Accident      LAX96LA321  1977-06-19
4  20041105X01764           Accident      CHI79FA064  1979-08-02
5  20170710X52551           Accident      NYC79AA106  1979-09-17
6  20001218X45446           Accident      CHI81LA106  1981-08-01
7  20020909X01562           Accident      SEA82DA022  1982-01-01
8  20020909X01561           Accident      NYC82DA015  1982-01-01
9  20020909X01560           Accident      MIA82DA029  1982-01-01

           Location        Country   Latitude  Longitude Airport.Code
\
0   MOOSE CREEK, ID  United States        NaN        NaN          NaN

1    BRIDGEPORT, CA  United States        NaN        NaN          NaN

2     Saltville, VA  United States  36.922223 -81.878056          NaN

3        EUREKA, CA  United States        NaN        NaN          NaN

4        Canton, OH  United States        NaN        NaN          NaN

5        BOSTON, MA  United States  42.445277 -70.758333          NaN

6        COTTON, MN  United States        NaN        NaN          NaN

7       PULLMAN, WA  United States        NaN        NaN          NaN

8  EAST HANOVER, NJ  United States        NaN        NaN          N58

9  JACKSONVILLE, FL  United States        NaN        NaN          JAX


         Airport.Name  ... Purpose.of.flight Air.carrier
Total.Fatal.Injuries  \
0                 NaN  ...          Personal         NaN
2.0
1                 NaN  ...          Personal         NaN
4.0
2                 NaN  ...          Personal         NaN
3.0
3                 NaN  ...          Personal         NaN
2.0
4                 NaN  ...          Personal         NaN
1.0
5                 NaN  ...               NaN  Air Canada
NaN
```

```
6                 NaN  ...          Personal        NaN
4.0
7  BLACKBURN AG STRIP  ...          Personal        NaN
0.0
8             HANOVER  ...          Business        NaN
0.0
9   JACKSONVILLE INTL  ...          Personal        NaN
0.0

  Total.Serious.Injuries Total.Minor.Injuries Total.Uninjured  \
0                    0.0                  0.0             0.0
1                    0.0                  0.0             0.0
2                    NaN                  NaN             NaN
3                    0.0                  0.0             0.0
4                    2.0                  NaN             0.0
5                    NaN                  1.0            44.0
6                    0.0                  0.0             0.0
7                    0.0                  0.0             2.0
8                    0.0                  0.0             2.0
9                    0.0                  3.0             0.0

  Weather.Condition  Broad.phase.of.flight   Report.Status
Publication.Date
0               UNK                 Cruise  Probable Cause
NaN
1               UNK                Unknown  Probable Cause       19-
09-1996
2               IMC                 Cruise  Probable Cause       26-
02-2007
3               IMC                 Cruise  Probable Cause       12-
09-2000
4               VMC               Approach  Probable Cause       16-
04-1980
5               VMC                  Climb  Probable Cause       19-
09-2017
6               IMC                Unknown  Probable Cause       06-
11-2001
7               VMC                Takeoff  Probable Cause       01-
01-1982
8               IMC                Landing  Probable Cause       01-
01-1982
9               IMC                 Cruise  Probable Cause       01-
01-1982

[10 rows x 31 columns]
```

```
df.tail(10)
```

```
             Event.Id Investigation.Type Accident.Number
Event.Date  \
```

```
90338  20221219106472          Accident      DCA23LA096  2022-12-18
90339  20221219106477          Accident      WPR23LA071  2022-12-18
90340  20221221106483          Accident      CEN23LA067  2022-12-21
90341  20221222106486          Accident      CEN23LA068  2022-12-21
90342  20221228106502          Accident      GAA23WA046  2022-12-22
90343  20221227106491          Accident      ERA23LA093  2022-12-26
90344  20221227106494          Accident      ERA23LA095  2022-12-26
90345  20221227106497          Accident      WPR23LA075  2022-12-26
90346  20221227106498          Accident      WPR23LA076  2022-12-26
90347  20221230106513          Accident      ERA23LA097  2022-12-29

               Location        Country Latitude Longitude Airport.Code  \
90338        Kahului, HI  United States      NaN       NaN          NaN
90339    San Manual, AZ  United States      NaN       NaN          NaN
90340  Auburn Hills, MI  United States      NaN       NaN          NaN
90341        Reserve, LA  United States      NaN       NaN          NaN
90342        Brasnorte,          Brazil      NaN       NaN          NaN
90343      Annapolis, MD  United States      NaN       NaN          NaN
90344        Hampton, NH  United States      NaN       NaN          NaN
90345         Payson, AZ  United States  341525N  1112021W          PAN
90346         Morgan, UT  United States      NaN       NaN          NaN
90347         Athens, GA  United States      NaN       NaN          NaN

      Airport.Name  ... Purpose.of.flight            Air.carrier  \
90338          NaN  ...               NaN  HAWAIIAN AIRLINES INC
90339          NaN  ...          Personal   Chandler Air Service
90340          NaN  ...          Personal                  Pilot
90341          NaN  ...     Instructional                    NaN
90342          NaN  ...               NaN                    NaN
90343          NaN  ...          Personal                    NaN
```

```
90344          NaN  ...            NaN                    NaN
90345       PAYSON  ...       Personal                    NaN
90346          NaN  ...       Personal     MC CESSNA 210N LLC
90347          NaN  ...       Personal                    NaN

       Total.Fatal.Injuries Total.Serious.Injuries Total.Minor.Injuries  \
90338                   0.0                    0.0                  0.0

90339                   0.0                    0.0                  0.0

90340                   0.0                    1.0                  0.0

90341                   0.0                    1.0                  0.0

90342                   1.0                    0.0                  0.0

90343                   0.0                    1.0                  0.0

90344                   0.0                    0.0                  0.0

90345                   0.0                    0.0                  0.0

90346                   0.0                    0.0                  0.0

90347                   0.0                    1.0                  0.0


       Total.Uninjured Weather.Condition  Broad.phase.of.flight
Report.Status  \
90338              0.0               NaN                    NaN
NaN
90339              3.0               NaN                    NaN
NaN
90340              0.0               NaN                    NaN
NaN
90341              1.0               NaN                    NaN
NaN
90342              0.0               NaN                    NaN
NaN
90343              0.0               NaN                    NaN
NaN
90344              0.0               NaN                    NaN
NaN
90345              1.0               VMC                    NaN
NaN
90346              0.0               NaN                    NaN
NaN
90347              1.0               NaN                    NaN
NaN
```

```
      Publication.Date
90338              NaN
90339       20-12-2022
90340       22-12-2022
90341       27-12-2022
90342       28-12-2022
90343       29-12-2022
90344              NaN
90345       27-12-2022
90346              NaN
90347       30-12-2022

[10 rows x 31 columns]
```

Data Preparation

Data Cleaning

I will normalize the column names for easier clarity.

```
df.columns = df.columns.str.lower().str.replace('.', '_')

df.head()
```

```
         event_id investigation_type accident_number  event_date  \
0  20001218X45444           Accident      SEA87LA080  1948-10-24
1  20001218X45447           Accident      LAX94LA336  1962-07-19
2  20061025X01555           Accident      NYC07LA005  1974-08-30
3  20001218X45448           Accident      LAX96LA321  1977-06-19
4  20041105X01764           Accident      CHI79FA064  1979-08-02

          location        country   latitude  longitude
airport_code  \
0  MOOSE CREEK, ID  United States        NaN        NaN          NaN

1   BRIDGEPORT, CA  United States        NaN        NaN          NaN

2    Saltville, VA  United States  36.922223 -81.878056          NaN

3       EUREKA, CA  United States        NaN        NaN          NaN

4       Canton, OH  United States        NaN        NaN          NaN


  airport_name  ... purpose_of_flight air_carrier total_fatal_injuries
\
0          NaN  ...          Personal         NaN                  2.0

1          NaN  ...          Personal         NaN                  4.0
```

```
2          NaN  ...          Personal        NaN                  3.0

3          NaN  ...          Personal        NaN                  2.0

4          NaN  ...          Personal        NaN                  1.0


  total_serious_injuries total_minor_injuries total_uninjured  \
0                    0.0                  0.0             0.0
1                    0.0                  0.0             0.0
2                    NaN                  NaN             NaN
3                    0.0                  0.0             0.0
4                    2.0                  NaN             0.0

  weather_condition  broad_phase_of_flight   report_status
publication_date
0               UNK                 Cruise  Probable Cause
NaN
1               UNK                Unknown  Probable Cause       19-
09-1996
2               IMC                 Cruise  Probable Cause       26-
02-2007
3               IMC                 Cruise  Probable Cause       12-
09-2000
4               VMC               Approach  Probable Cause       16-
04-1980

[5 rows x 31 columns]
```

Checking number of missing values in each column

```
df.isna().sum()
```

```
event_id                   1459
investigation_type            0
accident_number            1459
event_date                 1459
location                   1511
country                    1685
latitude                  55966
longitude                 55975
airport_code              40216
airport_name              37644
injury_severity            2459
aircraft_damage            4653
aircraft_category         58061
registration_number        2841
make                       1522
model                      1551
```

```
amateur_built                1561
number_of_engines            7543
engine_type                  8555
far_description             58325
schedule                    77766
purpose_of_flight            7651
air_carrier                 73700
total_fatal_injuries        12860
total_serious_injuries      13969
total_minor_injuries        13392
total_uninjured              7371
weather_condition            5951
broad_phase_of_flight       28624
report_status                7843
publication_date            16689
dtype: int64
```

I need to delete rows based on NaN values. In this case, the `accident_number` column should not have any missing values because it is a unique identifier.

```
df.dropna(subset=['accident_number'], inplace=True)
df.head()

         event_id investigation_type accident_number  event_date  \
0  20001218X45444           Accident      SEA87LA080  1948-10-24
1  20001218X45447           Accident      LAX94LA336  1962-07-19
2  20061025X01555           Accident      NYC07LA005  1974-08-30
3  20001218X45448           Accident      LAX96LA321  1977-06-19
4  20041105X01764           Accident      CHI79FA064  1979-08-02

          location        country   latitude  longitude
airport_code  \
0  MOOSE CREEK, ID  United States        NaN        NaN          NaN

1   BRIDGEPORT, CA  United States        NaN        NaN          NaN

2    Saltville, VA  United States  36.922223 -81.878056          NaN

3       EUREKA, CA  United States        NaN        NaN          NaN

4       Canton, OH  United States        NaN        NaN          NaN


  airport_name  ... purpose_of_flight air_carrier total_fatal_injuries
\
0          NaN  ...          Personal         NaN                  2.0

1          NaN  ...          Personal         NaN                  4.0

2          NaN  ...          Personal         NaN                  3.0
```

```
3          NaN  ...          Personal        NaN                 2.0

4          NaN  ...          Personal        NaN                 1.0


  total_serious_injuries total_minor_injuries total_uninjured  \
0                    0.0                  0.0             0.0
1                    0.0                  0.0             0.0
2                    NaN                  NaN             NaN
3                    0.0                  0.0             0.0
4                    2.0                  NaN             0.0

  weather_condition  broad_phase_of_flight   report_status
publication_date
0               UNK                 Cruise  Probable Cause
NaN
1               UNK                Unknown  Probable Cause       19-
09-1996
2               IMC                 Cruise  Probable Cause       26-
02-2007
3               IMC                 Cruise  Probable Cause       12-
09-2000
4               VMC               Approach  Probable Cause       16-
04-1980

[5 rows x 31 columns]
```

```
df.isna().sum()
```

```
event_id                      0
investigation_type            0
accident_number               0
event_date                    0
location                     52
country                     226
latitude                  54507
longitude                 54516
airport_code              38757
airport_name              36185
injury_severity            1000
aircraft_damage            3194
aircraft_category         56602
registration_number        1382
make                         63
model                        92
amateur_built               102
number_of_engines          6084
engine_type                7096
far_description           56866
```

```
schedule                    76307
purpose_of_flight            6192
air_carrier                 72241
total_fatal_injuries        11401
total_serious_injuries      12510
total_minor_injuries        11933
total_uninjured              5912
weather_condition            4492
broad_phase_of_flight       27165
report_status                6384
publication_date            15230
dtype: int64
```

```
df['aircraft_category'].unique()
```

```
array([nan, 'Airplane', 'Helicopter', 'Glider', 'Balloon',
'Gyrocraft',
       'Ultralight', 'Unknown', 'Blimp', 'Powered-Lift', 'Weight-
Shift',
       'Powered Parachute', 'Rocket', 'WSFT', 'UNK', 'ULTR'],
dtype=object)
```

```
df['make'].nunique()
```

```
8237
```

We also need to get rid of rows with NaN values in the model column because the make and the model are important attributes.

```
df.dropna(subset=['model'], inplace=True)
```

We also need to get rid of the duplicates especially for the make/model columns. So, we need to combine both columns and change the case to uppercase.

```
df['make/model'] = (df['make'] + ' ' + df['model']).str.upper()
df['make/model']
```

```
0                            STINSON 108-3
1                           PIPER PA24-180
2                              CESSNA 172M
3                             ROCKWELL 112
4                               CESSNA 501
                         ...
90343                      PIPER PA-28-151
90344                        BELLANCA 7ECA
90345    AMERICAN CHAMPION AIRCRAFT 8GCBC
90346                          CESSNA 210N
90347                      PIPER PA-24-260
Name: make/model, Length: 88797, dtype: object
```

```
df.drop_duplicates()

             event_id investigation_type accident_number
event_date  \
0      20001218X45444           Accident      SEA87LA080  1948-10-24

1      20001218X45447           Accident      LAX94LA336  1962-07-19

2      20061025X01555           Accident      NYC07LA005  1974-08-30

3      20001218X45448           Accident      LAX96LA321  1977-06-19

4      20041105X01764           Accident      CHI79FA064  1979-08-02

...               ...                ...             ...         ...

90343  20221227106491           Accident      ERA23LA093  2022-12-26

90344  20221227106494           Accident      ERA23LA095  2022-12-26

90345  20221227106497           Accident      WPR23LA075  2022-12-26

90346  20221227106498           Accident      WPR23LA076  2022-12-26

90347  20221230106513           Accident      ERA23LA097  2022-12-29


              location        country   latitude  longitude
airport_code  \
0      MOOSE CREEK, ID  United States        NaN        NaN
NaN
1       BRIDGEPORT, CA  United States        NaN        NaN
NaN
2        Saltville, VA  United States  36.922223 -81.878056
NaN
3           EUREKA, CA  United States        NaN        NaN
NaN
4           Canton, OH  United States        NaN        NaN
NaN
...                ...            ...        ...        ...          .
..
90343    Annapolis, MD  United States        NaN        NaN
NaN
90344      Hampton, NH  United States        NaN        NaN
NaN
90345       Payson, AZ  United States    341525N   1112021W
PAN
90346       Morgan, UT  United States        NaN        NaN
NaN
90347       Athens, GA  United States        NaN        NaN
NaN
```

```
      airport_name  ...        air_carrier total_fatal_injuries  \
0              NaN  ...                NaN                  2.0
1              NaN  ...                NaN                  4.0
2              NaN  ...                NaN                  3.0
3              NaN  ...                NaN                  2.0
4              NaN  ...                NaN                  1.0
...            ...  ...                ...                  ...
90343          NaN  ...                NaN                  0.0
90344          NaN  ...                NaN                  0.0
90345       PAYSON  ...                NaN                  0.0
90346          NaN  ...  MC CESSNA 210N LLC                  0.0
90347          NaN  ...                NaN                  0.0

      total_serious_injuries total_minor_injuries total_uninjured  \
0                        0.0                  0.0             0.0
1                        0.0                  0.0             0.0
2                        NaN                  NaN             NaN
3                        0.0                  0.0             0.0
4                        2.0                  NaN             0.0
...                      ...                  ...             ...
90343                    1.0                  0.0             0.0
90344                    0.0                  0.0             0.0
90345                    0.0                  0.0             1.0
90346                    0.0                  0.0             0.0
90347                    1.0                  0.0             1.0

      weather_condition broad_phase_of_flight   report_status  \
0                   UNK                Cruise  Probable Cause
1                   UNK               Unknown  Probable Cause
2                   IMC                Cruise  Probable Cause
3                   IMC                Cruise  Probable Cause
4                   VMC              Approach  Probable Cause
...                 ...                   ...             ...
90343               NaN                   NaN             NaN
90344               NaN                   NaN             NaN
90345               VMC                   NaN             NaN
90346               NaN                   NaN             NaN
90347               NaN                   NaN             NaN

      publication_date                         make/model
0                  NaN                    STINSON 108-3
1           19-09-1996                   PIPER PA24-180
2           26-02-2007                     CESSNA 172M
3           12-09-2000                    ROCKWELL 112
4           16-04-1980                      CESSNA 501
...                ...                              ...
90343       29-12-2022                  PIPER PA-28-151
90344              NaN                    BELLANCA 7ECA
90345       27-12-2022  AMERICAN CHAMPION AIRCRAFT 8GCBC
```

```
90346             NaN                          CESSNA 210N
90347      30-12-2022                      PIPER PA-24-260

[88797 rows x 32 columns]
```

Save the cleaned dataframe as csv file for later use

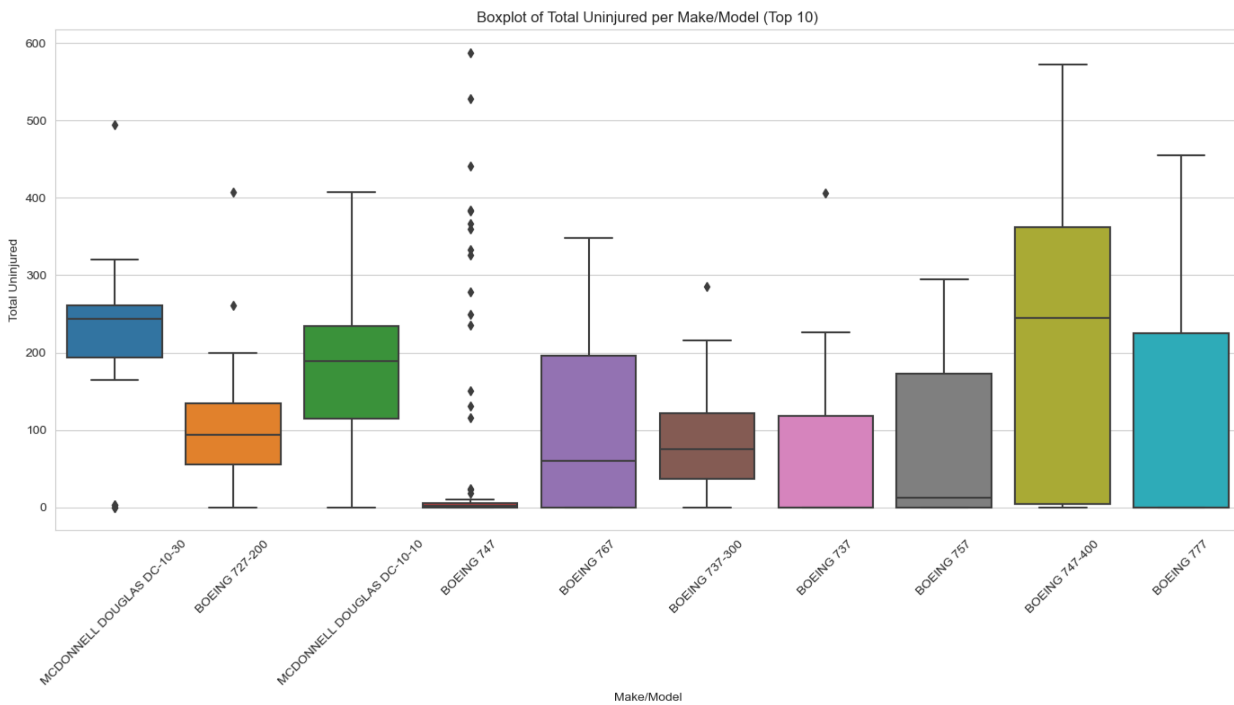
```
df.to_csv('aviation_data3.csv', index=False, encoding='utf-8',
na_rep='NA')
```

Data Visualization

We first have to see which make/model has the highest number of total uninjured cases.

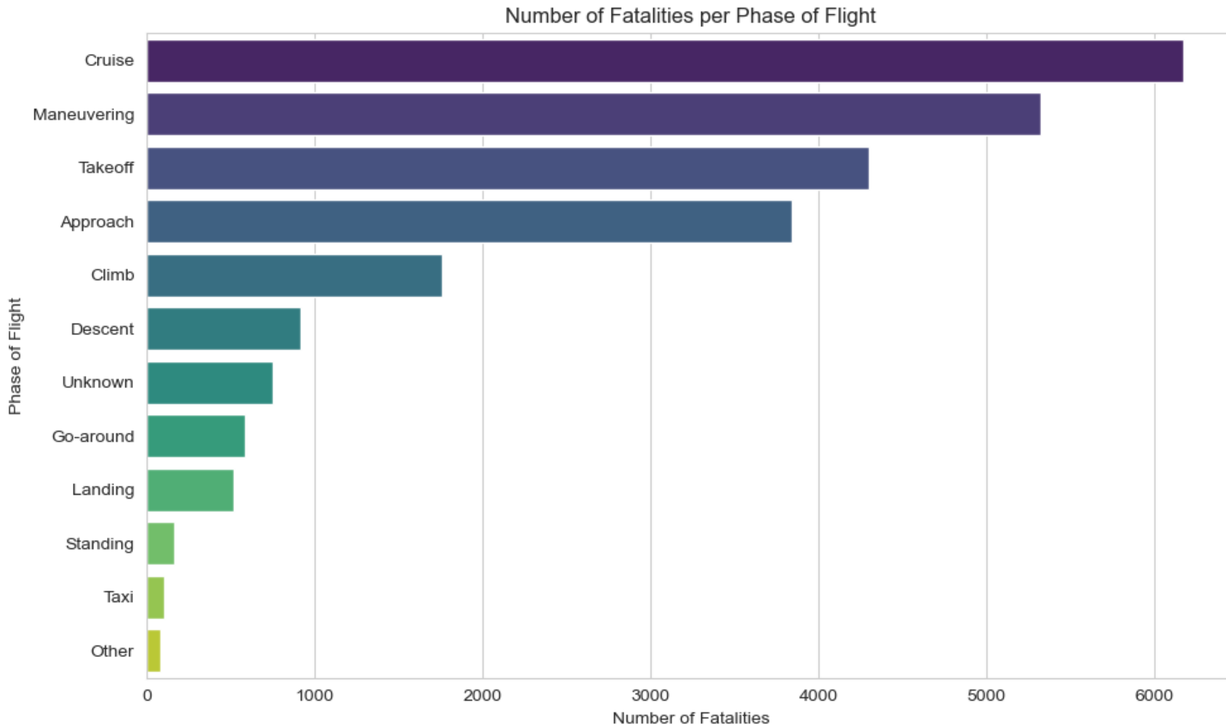
```
relevant_columns = ['make/model', 'total_uninjured']
mini_df = df[relevant_columns]

# Replace NaN values with 0 for total_uninjured
mini_df['total_uninjured'] = mini_df['total_uninjured'].fillna(0)

# Group by Make/Model and sum the total uninjured counts
agg_df = mini_df.groupby('make/model')
['total_uninjured'].sum().reset_index()

# Sort the DataFrame by total_uninjured in descending order and choose
the top 10
top_10_makes = agg_df.sort_values(by='total_uninjured',
ascending=False).head(10)

# Filter the original dataset to include only the top 10 make/models
top_10_makes_list = top_10_makes['make/model'].tolist()
filtered_df = mini_df[mini_df['make/model'].isin(top_10_makes_list)]

# Set the figure size for the plot
plt.figure(figsize=(14, 8))

# Create the boxplot
sns.boxplot(x='make/model', y='total_uninjured', data=filtered_df)

# Set plot labels and title
plt.title('Boxplot of Total Uninjured per Make/Model (Top 10)')
plt.xlabel('Make/Model')
plt.ylabel('Total Uninjured')

plt.xticks(rotation=45)

# Display the plot
plt.tight_layout()
plt.show()
```

```
C:\Users\PHIL CONRAD\AppData\Local\Temp\
ipykernel_9360\3334349586.py:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  mini_df['total_uninjured'] = mini_df['total_uninjured'].fillna(0)
```



We then visualize the number of fatalities according to the phase of flight.

```
fatalities_by_phase = df.groupby('broad_phase_of_flight')
['total_fatal_injuries'].sum().reset_index()

fatalities_by_phase =
fatalities_by_phase.sort_values(by='total_fatal_injuries',
ascending=False)

# Plotting the data
plt.figure(figsize=(10, 6))
sns.barplot(x='total_fatal_injuries', y='broad_phase_of_flight',
data=fatalities_by_phase, palette='viridis')
plt.xlabel('Number of Fatalities')
plt.ylabel('Phase of Flight')
plt.title('Number of Fatalities per Phase of Flight')
plt.tight_layout()
plt.show()
```



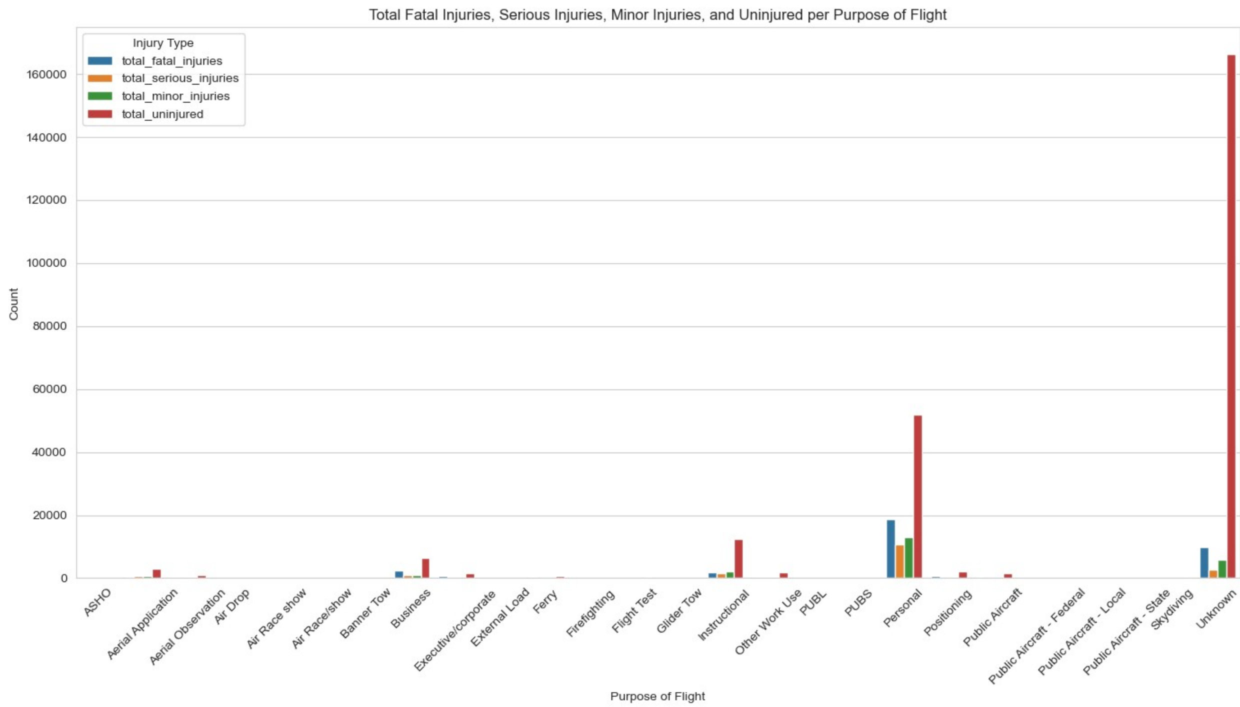

```
print(fatalities_by_phase)
```

```
   broad_phase_of_flight  total_fatal_injuries
2                 Cruise                6171.0
6            Maneuvering                5319.0
9                Takeoff                4302.0
0               Approach                3838.0
1                  Climb                1759.0
3                Descent                 913.0
11               Unknown                 749.0
4              Go-around                 587.0
5                Landing                 518.0
8               Standing                 161.0
10                  Taxi                 102.0
7                  Other                  85.0
```

We then visualize the total injuries and `total_uninjured` by the purpose of flight. However, there are many NaN values on the `purpose_of_flight` column. So we need to get rid of the rows with NaN values.

```
df.dropna(subset=['purpose_of_flight'], inplace=True)

required_columns = ['purpose_of_flight', 'total_fatal_injuries',
'total_serious_injuries', 'total_minor_injuries', 'total_uninjured']
min2_df = df[required_columns]

# Replace NaN values with 0 for injury counts
```

```
min2_df = min2_df.fillna(0)

# Group by Purpose of Flight and sum the injury counts
agg_df = min2_df.groupby('purpose_of_flight').sum().reset_index()

# Melt the aggregated DataFrame
melted_df = agg_df.melt(id_vars='purpose_of_flight',
                        value_vars=['total_fatal_injuries',
'total_serious_injuries', 'total_minor_injuries', 'total_uninjured'],
                        var_name='injury_type',
                        value_name='Count')

# Setting the figure size for the plot
plt.figure(figsize=(14, 8))

# Creating the bar plot
sns.barplot(x='purpose_of_flight', y='Count', hue='injury_type',
data=melted_df)

# Setting the title & plot labels
plt.title('Total Fatal Injuries, Serious Injuries, Minor Injuries, and
Uninjured per Purpose of Flight')
plt.xlabel('Purpose of Flight')
plt.ylabel('Count')
plt.xticks(rotation=45)
plt.legend(title='Injury Type')

# Display the plot
plt.tight_layout()
plt.show()
```




```
print(melted_df)
```

```
               purpose_of_flight           injury_type     Count
0                           ASHO  total_fatal_injuries      14.0
1             Aerial Application  total_fatal_injuries     549.0
2             Aerial Observation  total_fatal_injuries     414.0
3                       Air Drop  total_fatal_injuries      10.0
4                  Air Race show  total_fatal_injuries      42.0
..                           ...                   ...       ...
99     Public Aircraft - Federal       total_uninjured     267.0
100      Public Aircraft - Local       total_uninjured      96.0
101      Public Aircraft - State       total_uninjured      65.0
102                    Skydiving       total_uninjured     555.0
103                      Unknown       total_uninjured  166479.0

[104 rows x 3 columns]
```

```
df.isna().sum()
```

```
event_id                  0
investigation_type        0
accident_number           0
event_date                0
location                 42
country                 219
latitude              51585
longitude             51595
airport_code          34737
airport_name          32205
```

```
injury_severity              51
aircraft_damage            1569
aircraft_category         54841
registration_number         806
make                         17
model                         0
amateur_built                35
number_of_engines          3126
engine_type                3737
far_description           54730
schedule                  73956
purpose_of_flight             0
air_carrier               69195
total_fatal_injuries      10118
total_serious_injuries    11176
total_minor_injuries      10571
total_uninjured            5358
weather_condition          1139
broad_phase_of_flight     22058
report_status              3208
publication_date          14365
make/model                   17
dtype: int64
```

Recommendations

1. The BOEING 737 aircraft (airplane category) has the highest number of total_uninjured. That means that in case of an accident, there are more likely to be survivors at the scene. According to the chart, the top 10 aircraft are dominated by the BOEING make, making it the best choice to purchase and operate.
2. Cruise is the most fatal broad phase of flight as it has the most casualties. It is recommended to avoid purchasing aircraft that is associated with cruise as a phase of flight when accidents occur.
3. Personal as a purpose for flight has the highest number of uninjured victims hence the most recommended purpose of flight while operating the aircraft.