moringa_project1 / Project_One.ipynb

MICH-MAINA tracking error is notebook f07ed8e · 1 minute ago

2972 lines (2972 loc) · 211 KB

Preview Code Blame Raw

Final Project Submission

Student name: **Michelle Wangui Maina**

Student pace: **Part-time**

Scheduled project review date/time: **28th July 2025**

Instructor name: **Fidelis Wanalwenge**

#Business questions to answer

Question 1: Safest aircraft (fewest fatal accidents)

Question 2: Most common purpose of flight during accidents

Question 3: Countries with highest number of accidents

1. **Import the Relevant Library**

In [2]:
```
import pandas as pd
```

2. Load the Data into a DataFrame

In [12]:
```
aviation_data = pd.read_csv(r"C:\Users\mmaina\Documents\Flatiron\Project\mori
aviation_data.head()
```

Out[12]:

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	C
0	20001218X45444	Accident	SEA87LA080	1948-10-24	MOOSE CREEK, ID	
1	20001218X45447	Accident	LAX94LA336	1962-07-19	BRIDGEPORT, CA	
2	20061025X01555	Accident	NYC07LA005	1974-08-30	Saltville, VA	
3	20001218X45448	Accident	LAX96LA321	1977-06-19	EUREKA, CA	
4	20041105X01764	Accident	CHI79FA064	1979-08-02	Canton, OH	

5 rows × 31 columns

3. Get the information on the file

In [6]:
```
aviation_data.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
```

4. Data Cleaning

In [60]:
```
#Dropping columns with many missing values

aviation_data.drop(columns=['Latitude','Longitude', 'Schedule', 'Air.carrier'
```

In [61]:
```
aviation_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 32254 entries, 5 to 90345
Data columns (total 25 columns):
 #   Column                  Non-Null Count  Dtype         
---  ------                  --------------  -----         
 0   Event.Id                32254 non-null  object        
 1   Investigation.Type      32254 non-null  object        
 2   Accident.Number         32254 non-null  object        
 3   Event.Date              32254 non-null  datetime64[ns]
 4   Location                32245 non-null  object        
 5   Country                 32242 non-null  object        
 6   Injury.Severity         31372 non-null  object        
 7   Aircraft.damage         30798 non-null  object        
 8   Aircraft.Category       32254 non-null  object        
```

```
 9   Registration.Number     31970 non-null  object
 10  Make                    32245 non-null  object
 11  Model                   32254 non-null  object
 12  Amateur.Built           32235 non-null  object
 13  Number.of.Engines       28801 non-null  float64
 14  Engine.Type             26708 non-null  object
 15  Purpose.of.flight       27815 non-null  object
 16  Total.Fatal.Injuries    32254 non-null  float64
 17  Total.Serious.Injuries  32254 non-null  float64
 18  Total.Minor.Injuries    32254 non-null  float64
 19  Total.Uninjured         32254 non-null  float64
 20  Weather.Condition       28600 non-null  object
 21  Report.Status           26301 non-null  object
 22  Publication.Date        29606 non-null  datetime64[ns]
 23  total_injuries          32254 non-null  float64
 24  Year                    32254 non-null  int32
dtypes: datetime64[ns](2), float64(6), int32(1), object(16)
memory usage: 6.3+ MB
```

In [63]:

```
#Add new column
aviation_data['total_injuries'] = aviation_data['Total.Fatal.Injuries'] + avi

#Create a new column for year to get year trend
aviation_data['Year'] = pd.DatetimeIndex(aviation_data['Event.Date']).year

aviation_data.head()
```

Out[63]:

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Co
5	20170710X52551	Accident	NYC79AA106	1979-09-17	BOSTON, MA	U
7	20020909X01562	Accident	SEA82DA022	1982-01-01	PULLMAN, WA	U
8	20020909X01561	Accident	NYC82DA015	1982-01-01	EAST HANOVER, NJ	U
12	20020917X02148	Accident	FTW82FRJ07	1982-01-02	HOMER, LA	U
13	20020917X02134	Accident	FTW82FRA14	1982-01-02	HEARNE, TX	U

5 rows × 25 columns

In [65]:

```
#replace null with 0 total.Fatal.Injuries       Total.Serious.Injuries  Total

aviation_data[['Total.Fatal.Injuries','Total.Serious.Injuries','Total.Minor.I

aviation_data.head()
```

Out[65]:

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Co
5	20170710X52551	Accident	NYC79AA106	1979-09-17	BOSTON, MA	U
				1982-01-	PULLMAN,	U

7	20020909X01562	Accident	SEA82DA022	1982-01-01	WA	
8	20020909X01561	Accident	NYC82DA015	1982-01-01	EAST HANOVER, NJ	U
12	20020917X02148	Accident	FTW82FRJ07	1982-01-02	HOMER, LA	U
13	20020917X02134	Accident	FTW82FRA14	1982-01-02	HEARNE, TX	U

5 rows × 25 columns

In [64]:
```
#Delete rows where event ID is null
aviation_data = aviation_data.dropna(subset=['Event.Id', 'Model', 'Aircraft.C
aviation_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 32254 entries, 5 to 90345
Data columns (total 25 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   Event.Id                32254 non-null  object
 1   Investigation.Type      32254 non-null  object
 2   Accident.Number         32254 non-null  object
 3   Event.Date              32254 non-null  datetime64[ns]
 4   Location                32245 non-null  object
 5   Country                 32242 non-null  object
 6   Injury.Severity         31372 non-null  object
 7   Aircraft.damage         30798 non-null  object
 8   Aircraft.Category       32254 non-null  object
 9   Registration.Number     31970 non-null  object
 10  Make                    32245 non-null  object
 11  Model                   32254 non-null  object
 12  Amateur.Built           32235 non-null  object
 13  Number.of.Engines       28801 non-null  float64
 14  Engine.Type             26708 non-null  object
 15  Purpose.of.flight       27815 non-null  object
 16  Total.Fatal.Injuries    32254 non-null  float64
 17  Total.Serious.Injuries  32254 non-null  float64
 18  Total.Minor.Injuries    32254 non-null  float64
 19  Total.Uninjured         32254 non-null  float64
 20  Weather.Condition       28600 non-null  object
 21  Report.Status           26301 non-null  object
 22  Publication.Date        29606 non-null  datetime64[ns]
 23  total_injuries          32254 non-null  float64
 24  Year                    32254 non-null  int32
dtypes: datetime64[ns](2), float64(6), int32(1), object(16)
memory usage: 6.3+ MB
```

In [66]:
```
# Convert date columns
aviation_data['Event.Date'] = pd.to_datetime(aviation_data['Event.Date'], err
aviation_data['Publication.Date'] = pd.to_datetime(aviation_data['Publication
aviation_data.head()
```

Out[66]:

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Co
				1979-09-	BOSTON,	U

5	20170710X52551	Accident	NYC79AA106		17	MA
7	20020909X01562	Accident	SEA82DA022	1982-01-01	PULLMAN, WA	U
8	20020909X01561	Accident	NYC82DA015	1982-01-01	EAST HANOVER, NJ	U
12	20020917X02148	Accident	FTW82FRJ07	1982-01-02	HOMER, LA	U
13	20020917X02134	Accident	FTW82FRA14	1982-01-02	HEARNE, TX	U

5 rows × 25 columns

In [67]:
```
risk_summary = aviation_data.groupby('Make').agg({
    'Event.Id': 'count',
    'Total.Fatal.Injuries': 'sum',
    'total_injuries': 'sum'
}).rename(columns={'Event.Id': 'accident_count'}).sort_values(by='accident_co
risk_summary.head()
```

Out[67]:

Make	accident_count	Total.Fatal.Injuries	total_injuries
CESSNA	4864	1886.0	3865.0
Cessna	3607	1170.0	2514.0
PIPER	2804	1237.0	2339.0
Piper	1910	661.0	1346.0
BOEING	1036	2056.0	3529.0

In [68]:
```
aviation_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 32254 entries, 5 to 90345
Data columns (total 25 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   Event.Id                32254 non-null  object
 1   Investigation.Type      32254 non-null  object
 2   Accident.Number         32254 non-null  object
 3   Event.Date              32254 non-null  datetime64[ns]
 4   Location                32245 non-null  object
 5   Country                 32242 non-null  object
 6   Injury.Severity         31372 non-null  object
 7   Aircraft.damage         30798 non-null  object
 8   Aircraft.Category       32254 non-null  object
 9   Registration.Number     31970 non-null  object
 10  Make                    32245 non-null  object
 11  Model                   32254 non-null  object
 12  Amateur.Built           32235 non-null  object
 13  Number.of.Engines       32254 non-null  float64
```

```
 14  Engine.Type             26708 non-null  object
 15  Purpose.of.flight       27815 non-null  object
 16  Total.Fatal.Injuries    32254 non-null  float64
 17  Total.Serious.Injuries  32254 non-null  float64
 18  Total.Minor.Injuries    32254 non-null  float64
 19  Total.Uninjured         32254 non-null  float64
 20  Weather.Condition       28600 non-null  object
 21  Report.Status           26301 non-null  object
 22  Publication.Date        29606 non-null  datetime64[ns]
 23  total_injuries          32254 non-null  float64
 24  Year                    32254 non-null  int32
dtypes: datetime64[ns](2), float64(6), int32(1), object(16)
memory usage: 6.3+ MB
```

In [70]:

```
aviation_data['Injury.Severity'] = aviation_data['Injury.Severity'].str.upper
aviation_data['Injury.Severity'] = aviation_data['Injury.Severity'].replace(
    to_replace=r'FATAL\(\d+\)|FATAL', value='FATAL', regex=True)

aviation_data.head()
```

Out[70]:

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Co
5	20170710X52551	Accident	NYC79AA106	1979-09-17	BOSTON, MA	U
7	20020909X01562	Accident	SEA82DA022	1982-01-01	PULLMAN, WA	U
8	20020909X01561	Accident	NYC82DA015	1982-01-01	EAST HANOVER, NJ	U
12	20020917X02148	Accident	FTW82FRJ07	1982-01-02	HOMER, LA	U
13	20020917X02134	Accident	FTW82FRA14	1982-01-02	HEARNE, TX	U

5 rows × 25 columns

In [79]:

```
#fill null vales in weather conditions with unknown and replace unk with unkn
aviation_data['Weather.Condition'] = aviation_data['Weather.Condition'].filln
aviation_data['Weather.Condition'] = aviation_data['Weather.Condition'].repla

#replace null and unavilable in injuries serverity with unkown
aviation_data['Injury.Severity'] = aviation_data['Injury.Severity'].fillna('U
aviation_data['Injury.Severity'] = aviation_data['Injury.Severity'].replace('

aviation_data['Aircraft.damage'] = aviation_data['Aircraft.damage'].fillna('U

aviation_data['Report.Status'] = aviation_data['Report.Status'].fillna('Unkno

aviation_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 32254 entries, 5 to 90345
Data columns (total 25 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
```

```
 0   Event.Id                32254 non-null  object
 1   Investigation.Type      32254 non-null  object
 2   Accident.Number         32254 non-null  object
 3   Event.Date              32254 non-null  datetime64[ns]
 4   Location                32245 non-null  object
 5   Country                 32242 non-null  object
 6   Injury.Severity         32254 non-null  object
 7   Aircraft.damage         32254 non-null  object
 8   Aircraft.Category       32254 non-null  object
 9   Registration.Number     31970 non-null  object
 10  Make                    32245 non-null  object
 11  Model                   32254 non-null  object
 12  Amateur.Built           32235 non-null  object
 13  Number.of.Engines       32254 non-null  float64
 14  Engine.Type             26708 non-null  object
 15  Purpose.of.flight       27815 non-null  object
 16  Total.Fatal.Injuries    32254 non-null  float64
 17  Total.Serious.Injuries  32254 non-null  float64
 18  Total.Minor.Injuries    32254 non-null  float64
 19  Total.Uninjured         32254 non-null  float64
 20  Weather.Condition       32254 non-null  object
 21  Report.Status           32254 non-null  object
 22  Publication.Date        29606 non-null  datetime64[ns]
 23  total_injuries          32254 non-null  float64
 24  Year                    32254 non-null  int32
dtypes: datetime64[ns](2), float64(6), int32(1), object(16)
memory usage: 6.3+ MB
```

In [81]:

```
#Copy of the csv to export
aviation_data.to_csv('aviation_data_cleaned.csv', index=False)

aviation_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 32254 entries, 5 to 90345
Data columns (total 25 columns):
 #   Column                  Non-Null Count  Dtype
---  ------                  --------------  -----
 0   Event.Id                32254 non-null  object
 1   Investigation.Type      32254 non-null  object
 2   Accident.Number         32254 non-null  object
 3   Event.Date              32254 non-null  datetime64[ns]
 4   Location                32245 non-null  object
 5   Country                 32242 non-null  object
 6   Injury.Severity         32254 non-null  object
 7   Aircraft.damage         32254 non-null  object
 8   Aircraft.Category       32254 non-null  object
 9   Registration.Number     31970 non-null  object
 10  Make                    32245 non-null  object
 11  Model                   32254 non-null  object
 12  Amateur.Built           32235 non-null  object
 13  Number.of.Engines       32254 non-null  float64
 14  Engine.Type             26708 non-null  object
 15  Purpose.of.flight       27815 non-null  object
 16  Total.Fatal.Injuries    32254 non-null  float64
 17  Total.Serious.Injuries  32254 non-null  float64
 18  Total.Minor.Injuries    32254 non-null  float64
 19  Total.Uninjured         32254 non-null  float64
 20  Weather.Condition       32254 non-null  object
 21  Report.Status           32254 non-null  object
 22  Publication.Date        29606 non-null  datetime64[ns]
 23  total_injuries          32254 non-null  float64
 24  Year                    32254 non-null  int32
dtypes: datetime64[ns](2), float64(6), int32(1), object(16)
```

```
memory usage: 6.3+ MB
```

In [83]:

```
# Question 1: Safest aircraft (fewest fatal accidents)
safe_aircraft = (
    aviation_data.groupby(['Make', 'Model'], dropna=True)['Total.Fatal.Injuri
    .sum()
    .reset_index()
    .sort_values(by='Total.Fatal.Injuries', ascending=True)
)
safe_aircraft_top5 = safe_aircraft[safe_aircraft['Total.Fatal.Injuries'] == 0
print("Top 5 Aircraft with 0 Fatal Injuries:\n", safe_aircraft_top5)

# Question 2: Most common purpose of flight during accidents
purpose_counts = aviation_data['Purpose.of.flight'].value_counts().head(5)
print("\nTop 5 Purposes of Flight with Most Accidents:\n", purpose_counts)

# Question 3: Countries with highest number of accidents
top_countries = aviation_data['Country'].value_counts().head(5)
print("\nTop 5 Countries with Most Aircraft Accidents:\n", top_countries)
```

```
Top 5 Aircraft with 0 Fatal Injuries:
                         Make                 Model  Total.Fatal.Injuries
5540  HUGHES HELICOPTERS INC                   369                   0.0
5556                 Hagerty  Glasair Super IIS-TD                   0.0
5558                    Hahn  R-W22 Tiger Moth Rep                   0.0
5559                  Haines                Searey                   0.0
5560                Halbrook            Rans S-6S                    0.0

Top 5 Purposes of Flight with Most Accidents:
 Purpose.of.flight
Personal              17718
Instructional          3867
Aerial Application     1384
Unknown                1131
Business                946
Name: count, dtype: int64

Top 5 Countries with Most Aircraft Accidents:
 Country
United States     28133
Brazil              304
United Kingdom      256
Mexico              244
Canada              218
Name: count, dtype: int64
```

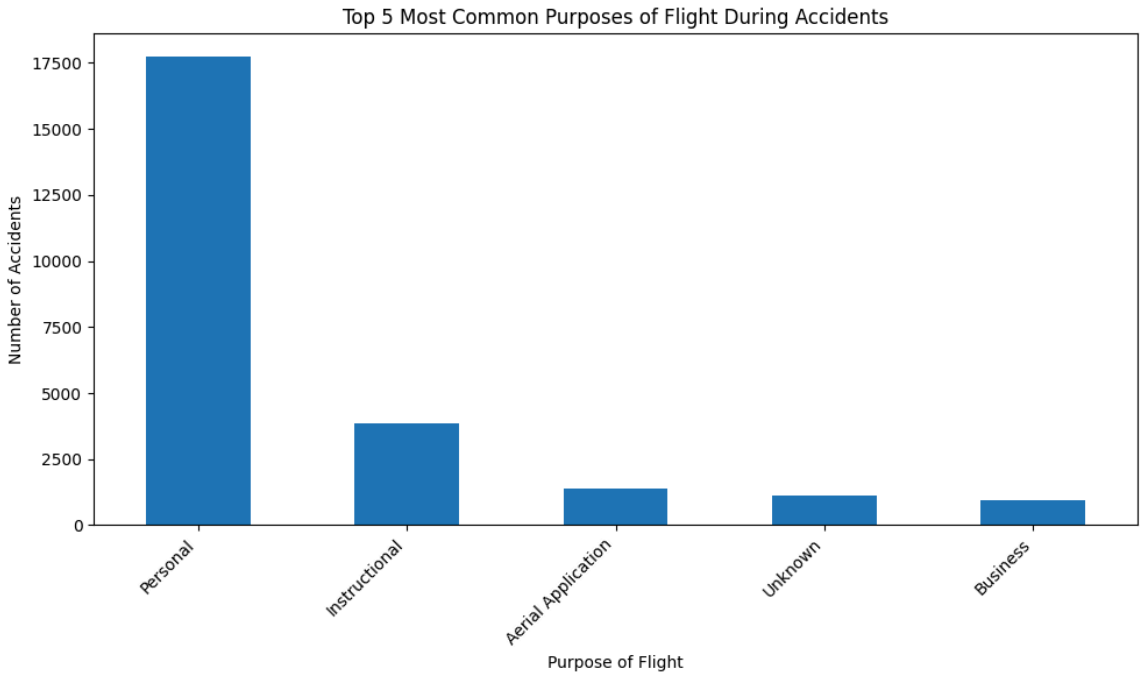
In [87]:

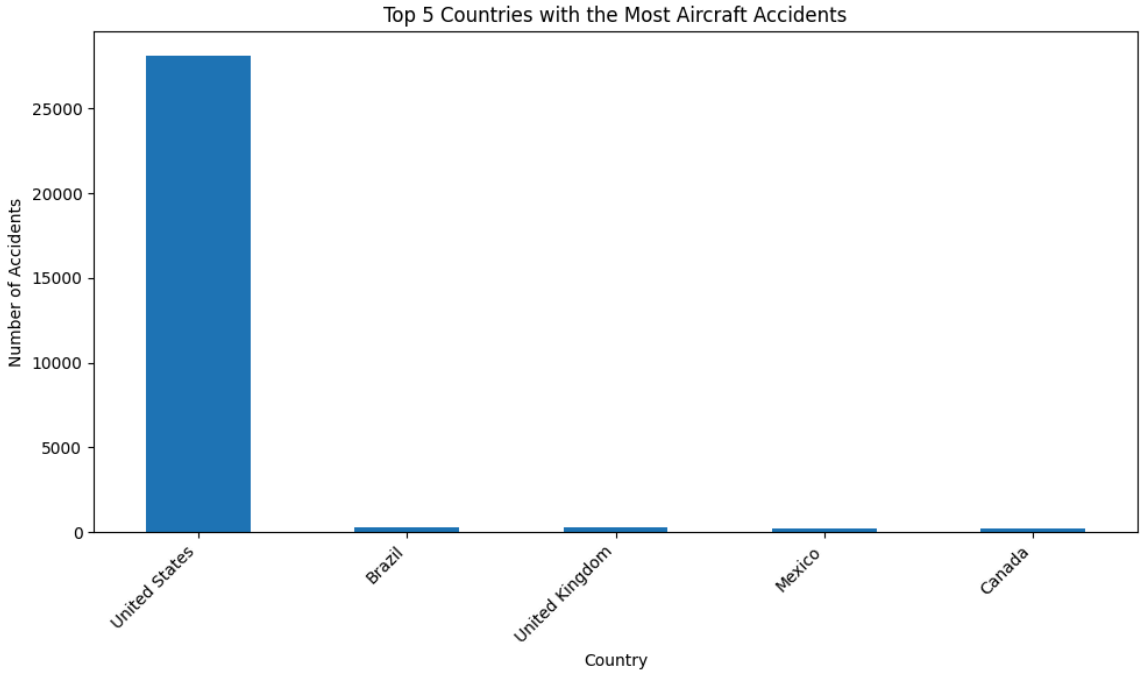
```
import matplotlib.pyplot as plt


# Chart 2: Top 5 Purposes of Flight with Most Accidents
plt.figure(figsize=(10, 6))
purpose_counts.plot(kind='bar')
plt.xlabel('Purpose of Flight')
plt.ylabel('Number of Accidents')
plt.title('Top 5 Most Common Purposes of Flight During Accidents')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()

# Chart 3: Top 5 Countries with Most Aircraft Accidents
plt.figure(figsize=(10, 6))
top_countries.plot(kind='bar')
plt.xlabel('Country')
```

```
plt.xlabel('Country')
plt.ylabel('Number of Accidents')
plt.title('Top 5 Countries with the Most Aircraft Accidents')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```





In [ ]: