Medsoar Ventures Limited

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Overview

Medsoar Limited, known for its success in pharmaceuticals, is taking a new venture into the aviation sector. The company plans to buy and operate aircraft for both commercial and private clients. To make smart choices, it's using data science to analyze aviation records and performance metrics, helping identify the safest and most reliable planes. This approach ensures a smooth, efficient, and low-risk entry into the industry.

Business Problem

Medsoar Limited is expanding into the aviation sector by acquiring and operating aircraft for commercial and private enterprises. However, entering a highly regulated and capital-intensive industry comes with significant risks, including safety concerns, operational costs, and aircraft reliability. The company needs a data-driven approach to identify the most suitable planes that minimize risk, optimize efficiency, and ensure long-term profitability.

Data Understanding

The data being used in the determining the aircrafts with the lowest risk for the company come from the National Transportation Safety Board that includes aviation accident data from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters. This Data was obtained from Kaggle, a datascience platform which has multiple datasets From this data we can selectively filter out the airplanes that do not fit the company's goals

```
# Import standard packages
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

%matplotlib inline
```

the NTSB dataset

THe dataset contained two files; AviationData.csv and USState_codes.csv

the dataset in AviationData.csv of the National Transportation Safety Board includes aviation accident data from 1962 to 2023 about civil aviation accidents and selected incidents in the United States and international waters

```
df=pd.read_csv('data/AviationData.csv', encoding="ISO-8859-1")
df.head()
```

```
c:\Users\chris\anaconda3\anaconda4\envs\learn-env\lib\site-packages\
IPython\core\interactiveshell.py:3145: DtypeWarning: Columns (6,7,28)
have mixed types.Specify dtype option on import or set
low_memory=False.
  has_raised = await self.run_ast_nodes(code_ast.body, cell_name,
```

	Event.Id	Investigation.Type	Accident.Number	Event.Date	Location	Country	Latitude	Longitude	Airport.Code	Airport.Name	...	Purpose.of.flight	Air.carrier	Total.Fatal.Injuries	Total.Serious.Injuries	Total.Minor.Injuries	Total.Uninjured	Weather.Condition	Broad.phase.of.flight	Report.Status	Publication.Date
0	20001218X45444	Accident	SEA87LA080	1948-10-24	MOOSE CREEK, ID	United States	NaN	NaN	NaN	NaN	...	Personal	NaN	2.0	0.0	0.0	0.0	UNK	Cruise	Probable Cause	NaN
1	20001218X45447	Accident	LAX94LA336	1962-07-19	BRIDGEPORT, CA	United States	NaN	NaN	NaN	NaN	...	Personal	NaN	4.0	0.0	0.0	0.0				
2	20061025X01555	Accident	NYC07LA005	1974-08-30	Saltville, VA	United States	36.9222	-81.8781	NaN	NaN	...	Personal	NaN	3.0	NaN	NaN	NaN				
3	20001218X45448	Accident	LAX96LA321	1977-06-19	EUREKA, CA	United States	NaN	NaN	NaN	NaN	...	Personal	NaN	2.0	0.0	0.0	0.0				
4	20041105X01764	Accident	CHI79FA064	1979-08-02	Canton, OH	United States	NaN	NaN	NaN	NaN	...	Personal	NaN	1.0	2.0	NaN	0.0				

```
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]
```

USA-States Dataset

This dataset involves different USA states with their unique codes and it can be corelated to the location of where the aciidents happened in the AviationData.csv files

```
state_code= pd.read_csv('data/USState_codes.csv')
state_code.head()
```

```
     US_State Abbreviation
0     Alabama           AL
1      Alaska           AK
2     Arizona           AZ
3    Arkansas           AR
4  California           CA
```

Data Preparation

AviationData Dataframe

First of all out of the 31 colums in the NTSB dataset, I decided to filter out 20 of the columns which i did not find meaningful or they were redundant in my sorting of data and decided to keep 10 relevant columns. I decided to create a new column, Total injuries which was to encompass Total fatal injuries, total serious and total minor injuries

```
df['tot_injuries']=df['Total.Fatal.Injuries'] +
df['Total.Serious.Injuries'] + df['Total.Minor.Injuries']
```

Important columns

This were the 10 columns that were valuable in the goal of the objective

```
imp_columns=['Event.Date','Location','Make','Model','Purpose.of.flight
','Aircraft.damage','Injury.Severity',
'Amateur.Built','Engine.Type','Broad.phase.of.flight','tot_injuries']

df=df[imp_columns]
df
```

```
       Event.Date         Location                          Make
Model  \
0      1948-10-24  MOOSE CREEK, ID                       Stinson
108-3
1      1962-07-19   BRIDGEPORT, CA                         Piper   PA24-
180
2      1974-08-30    Saltville, VA                        Cessna
172M
3      1977-06-19       EUREKA, CA                      Rockwell
112
4      1979-08-02       Canton, OH                        Cessna
501
...           ...              ...                           ...
...
88884  2022-12-26    Annapolis, MD                         PIPER  PA-28-
151
88885  2022-12-26      Hampton, NH                       BELLANCA
7ECA
88886  2022-12-26       Payson, AZ  AMERICAN CHAMPION AIRCRAFT
8GCBC
88887  2022-12-26       Morgan, UT                         CESSNA
210N
88888  2022-12-29       Athens, GA                         PIPER  PA-24-
260

      Purpose.of.flight Aircraft.damage Injury.Severity Amateur.Built
\
0              Personal       Destroyed        Fatal(2)             No

1              Personal       Destroyed        Fatal(4)             No

2              Personal       Destroyed        Fatal(3)             No

3              Personal       Destroyed        Fatal(2)             No

4              Personal       Destroyed        Fatal(1)             No

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

88884          Personal             NaN           Minor             No

88885               NaN             NaN             NaN             No

88886          Personal     Substantial       Non-Fatal             No
```

```
88887          Personal               NaN              NaN             No

88888          Personal               NaN            Minor             No


         Engine.Type Broad.phase.of.flight  tot_injuries
0      Reciprocating                Cruise           2.0
1      Reciprocating               Unknown           4.0
2      Reciprocating                Cruise           NaN
3      Reciprocating                Cruise           2.0
4                NaN              Approach           NaN
...              ...                   ...           ...
88884            NaN                   NaN           1.0
88885            NaN                   NaN           0.0
88886            NaN                   NaN           0.0
88887            NaN                   NaN           0.0
88888            NaN                   NaN           1.0

[88889 rows x 11 columns]

df.shape

(88889, 11)
```

Next step was to determine the information of the dataset available and how many null values it contained

```
null_counts = df.isnull().sum()
print(null_counts)

Event.Date                    0
Location                     52
Make                         63
Model                        92
Purpose.of.flight          6192
Aircraft.damage            3194
Injury.Severity            1000
Amateur.Built               102
Engine.Type                7077
Broad.phase.of.flight     27165
tot_injuries              14466
dtype: int64
```

it looked loke all the columns apart from the event date had a null value. Since the main purpose of Medsoar Limited while entering the Aviation Sector is to oncur as little risk as possible in the new business, all null values in the Aircraft.damage,'Injury.Severity' were removed since this was a very crucial information. Also since Medsoar plans to enter the commercial and private sector in the aviation business all aircrafts with null values are alsomremoved since we do not know

their purpose. Make, Engine type and model null values were also removed since we do not know what aircraft it was

```
df = df.dropna(axis=0,
subset=["Make","Model","Purpose.of.flight","Aircraft.damage","Injury.Severity","Engine.Type","Location","Amateur.Built","Broad.phase.of.flight"])


df
```

```
       Event.Date         Location                 Make          Model
\
0      1948-10-24  MOOSE CREEK, ID               Stinson          108-3

1      1962-07-19   BRIDGEPORT, CA                 Piper       PA24-180

2      1974-08-30    Saltville, VA               Cessna           172M

3      1977-06-19       EUREKA, CA              Rockwell            112

6      1981-08-01       COTTON, MN               Cessna            180

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

63906  2007-12-29      Crowley, TX              Althouse  RAF 2000 GTX

63908  2007-12-30     CHEROKEE, AL                 Bell        206L-3

63909  2007-12-30  PASO ROBLES, CA  Cirrus Design Corp.          SR22

63910  2007-12-30   ALEXANDRIA, MN                Lerohl          RV-8

63911  2007-12-31    SANTA ANA, CA                 Piper         PA-12


      Purpose.of.flight Aircraft.damage Injury.Severity Amateur.Built
\
0              Personal       Destroyed        Fatal(2)            No

1              Personal       Destroyed        Fatal(4)            No

2              Personal       Destroyed        Fatal(3)            No

3              Personal       Destroyed        Fatal(2)            No

6              Personal       Destroyed        Fatal(4)            No

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

63906          Personal       Destroyed        Fatal(2)           Yes
```

```
63908    Other Work Use     Substantial        Fatal(3)             No

63909          Personal     Substantial        Fatal(1)             No

63910          Personal     Substantial       Non-Fatal            Yes

63911     Instructional     Substantial       Non-Fatal             No


         Engine.Type Broad.phase.of.flight  tot_injuries
0      Reciprocating                Cruise           2.0
1      Reciprocating               Unknown           4.0
2      Reciprocating                Cruise           NaN
3      Reciprocating                Cruise           2.0
6      Reciprocating               Unknown           4.0
...              ...                   ...           ...
63906  Reciprocating           Maneuvering           2.0
63908    Turbo Shaft           Maneuvering           3.0
63909  Reciprocating           Maneuvering           NaN
63910  Reciprocating              Takeoff            NaN
63911  Reciprocating               Landing           NaN

[59027 rows x 11 columns]
```

Since the 'tot_injuries' column is an important one for analysis and is a float, it contains too many missing values to drop all (14446 in total) I decided to replace the null with median

```
df = df.copy()
df['tot_injuries'] =
df['tot_injuries'].fillna(df['tot_injuries'].median())

null_counts = df.isnull().sum()
print(null_counts)
```

```
Event.Date                0
Location                  0
Make                      0
Model                     0
Purpose.of.flight         0
Aircraft.damage           0
Injury.Severity           0
Amateur.Built             0
Engine.Type               0
Broad.phase.of.flight     0
tot_injuries              0
dtype: int64
```

after dealing with the AviationData.csv Dataframe and ensuring all info lacks null values the next step was the USA-States Dataframe

USA_States Dataset

In this set first of all i checked for null values

```
null_counts = state_code.isnull().sum()
print(null_counts)
```

```
US_State         0
Abbreviation     0
dtype: int64
```

Since It has no missing value we can proceed to analyising data

DATA ANALYSIS

After dealing with the null values. the next step was data analysis

Number of planes fitting the Purpose of Private and Commercial ventures

The purpose of flight column was filtered to obtain planes that were for commercial and private enterprises since the main purpose of Medsoar limited is to enter those spaces. The column was filtered to obtain only for those purposes

```
df['Purpose.of.flight'].unique()
```

```
array(['Personal', 'Business', 'Instructional', 'Unknown', 'Ferry',
       'Executive/corporate', 'Aerial Observation', 'Aerial
Application',
       'Public Aircraft', 'Skydiving', 'Other Work Use',
'Positioning',
       'Flight Test', 'Air Race/show', 'Air Drop', 'Glider Tow',
       'Public Aircraft - Local', 'Public Aircraft - Federal',
       'External Load', 'Public Aircraft - State', 'Banner Tow',
       'Firefighting'], dtype=object)
```

from the above code we obtained the different unique purposes which each aircraft was being used for. SInce the purposes of Medsoar is in commercial and private ventures we will choose: Personal, Business, Executive/corprate and Ferry

```
df = df[df["Purpose.of.flight"].isin(["Personal",
"Business","Executive/corporate","Ferry"])]

df
```

```
       Event.Date           Location
Make  \
0      1948-10-24    MOOSE CREEK, ID                          Stinson

1      1962-07-19     BRIDGEPORT, CA                            Piper

2      1974-08-30      Saltville, VA                           Cessna

3      1977-06-19         EUREKA, CA                         Rockwell

6      1981-08-01         COTTON, MN                           Cessna

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

63904  2007-12-29  CRYSTAL FALLS, MI                           Cessna

63905  2007-12-29       ABINGDON, IL  Ercoupe (eng & Research Corp.)

63906  2007-12-29        Crowley, TX                         Althouse

63909  2007-12-30    PASO ROBLES, CA             Cirrus Design Corp.

63910  2007-12-30     ALEXANDRIA, MN                           Lerohl

               Model Purpose.of.flight Aircraft.damage Injury.Severity
\
0              108-3          Personal       Destroyed        Fatal(2)

1          PA24-180          Personal       Destroyed        Fatal(4)

2              172M          Personal       Destroyed        Fatal(3)

3               112          Personal       Destroyed        Fatal(2)

6               180          Personal       Destroyed        Fatal(4)

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

63904          172F          Personal     Substantial       Non-Fatal

63905          415D          Personal     Substantial       Non-Fatal

63906  RAF 2000 GTX          Personal       Destroyed        Fatal(2)

63909          SR22          Personal     Substantial        Fatal(1)

63910          RV-8          Personal     Substantial       Non-Fatal

      Amateur.Built    Engine.Type Broad.phase.of.flight  tot_injuries
```

```
0                 No  Reciprocating                 Cruise           2.0
1                 No  Reciprocating                Unknown           4.0
2                 No  Reciprocating                 Cruise           0.0
3                 No  Reciprocating                 Cruise           2.0
6                 No  Reciprocating                Unknown           4.0
...              ...            ...                    ...           ...
63904             No  Reciprocating                Landing           0.0
63905             No  Reciprocating           Maneuvering            0.0
63906            Yes  Reciprocating           Maneuvering            2.0
63909             No  Reciprocating           Maneuvering            0.0
63910            Yes  Reciprocating                Takeoff           0.0

[39340 rows x 11 columns]
```

```
plane_purpose = df["Purpose.of.flight"].value_counts()
print(plane_purpose)
```

```
Personal               34981
Business                3300
Ferry                    657
Executive/corporate      402
Name: Purpose.of.flight, dtype: int64
```

These are the number of plane models that fit the purpose of Medsoar limited

The different types of Aircraft models

After determining how many types of aircrafts fit the goal of Medsoar limited, the next step was to determine the different makes of the airplanes available for chossing

```
plane_make = df["Make"].unique()
print(plane_make)
```

```
['Stinson' 'Piper' 'Cessna' ... 'Hein' 'Althouse' 'Lerohl']
```

```
num_unique_planes = df["Make"].nunique()

print(num_unique_planes)
```

```
3984
```

```
plane_counts = df["Make"].value_counts()

print(plane_counts)
```

```
Cessna            13703
Piper              8224
Beech              2940
Mooney              940
Bellanca            672
                   ...
Girard                1
Silvaggio             1
Wood-oldfield         1
Fleming               1
Waspair Tomcat        1
Name: Make, Length: 3984, dtype: int64
```

From the above data it was discovered that the CESSNA and cessna had each been classified as unique values yet they represented the same plane hence it had to be grouped as one to avoid improper analysis

```
df = df.copy()
df["Make"] = df["Make"].str.lower()

print(df["Make"].unique())
```

```
['stinson' 'piper' 'cessna' ... 'hein' 'althouse' 'lerohl']
```

Plane Manufacturer in relation to the number of fatalities and Aircraft Damage

In this section The aircrafts are further filtered to the ones with only minor aircraft damage while those with substantial and destroyed ones are dropped

```
df=df[df['Aircraft.damage']== 'Minor']

df
```

```
       Event.Date        Location           Make                   Model
\
23     1982-01-03    VAN NUYS, CA         piper              PA-24-180

40     1982-01-05   PENSACOLA, FL      rockwell                   114

119    1982-01-19  WASHINGTON, DC  de havilland              DHC-6-300
```

```
131    1982-01-20    SAN JOSE, CA         piper              PA-31-350
194    1982-01-30     TRUCKEE, CA         piper           PA-28R-201T
...           ...             ...           ...                   ...
63182  2007-08-15       Alton, IL         piper           PA-32R-301T
63347  2007-09-08   Kerrville, TX        mooney                M20TN
63490  2007-10-02     Ashland, KY       degelia  Rotor Flight Dynamic
63519  2007-10-06    El Cajon, CA      yakovlev                YAK-50
63896  2007-12-26       Aspen, CO         piper            PA-46-310P

         Purpose.of.flight Aircraft.damage Injury.Severity
Amateur.Built  \
23                Personal           Minor        Incident
No
40                Business           Minor        Incident
No
119                  Ferry           Minor        Incident
No
131    Executive/corporate           Minor        Incident
No
194               Personal           Minor        Incident
No
...                    ...             ...             ...            .
..
63182             Business           Minor        Incident
No
63347             Personal           Minor        Incident
No
63490             Personal           Minor       Non-Fatal
Yes
63519             Personal           Minor       Non-Fatal
No
63896             Personal           Minor        Incident
No

         Engine.Type Broad.phase.of.flight  tot_injuries
23     Reciprocating              Approach           0.0
40     Reciprocating                Cruise           0.0
119       Turbo Prop               Descent           0.0
131    Reciprocating               Takeoff           0.0
194    Reciprocating               Landing           0.0
...              ...                   ...           ...
```

```
63182  Reciprocating               Descent           0.0
63347  Reciprocating               Landing           0.0
63490  Reciprocating               Landing           0.0
63519  Reciprocating               Landing           0.0
63896  Reciprocating                 Climb           0.0

[464 rows x 11 columns]
```

```
import pandas as pd

# Assuming df is your DataFrame already filtered to only 'minor' in
Aircraft.damage
# Count minor incidents by aircraft Make
minor_counts = df['Make'].value_counts().reset_index()
minor_counts.columns = ['Make', 'Minor_Incidents_Count']

# Sort by count (ascending to find least frequent)
minor_counts_sorted =
minor_counts.sort_values('Minor_Incidents_Count')

# Get the manufacturer with least minor incidents
least_minor_make = minor_counts_sorted.iloc[0]

# Display results
print("Aircraft Manufacturer with Least Minor Incidents:")
print(f"Make: {least_minor_make['Make']}")
print(f"Number of Minor Incidents:
{least_minor_make['Minor_Incidents_Count']}")

print("\nAll Manufacturers by Minor Incident Count (Ascending
Order):")
print(minor_counts_sorted.to_string(index=False))
```

```
Aircraft Manufacturer with Least Minor Incidents:
Make: sprague
Number of Minor Incidents: 1

All Manufacturers by Minor Incident Count (Ascending Order):
                      Make  Minor_Incidents_Count
                   sprague                      1
     classic aircraft corp.                      1
                   dornier                      1
                     semco                      1
                    coelho                      1
                    barnes                      1
   new piper aircraft, inc.                      1
                  ultimate                      1
                   convair                      1
                   degelia                      1
```

maule	1
starflight	1
unknown	1
kolb company	1
swearingen	1
aviat	1
kosch	1
avions marcel dassault	1
aircoupe	1
american general aircraft	1
buchmann	1
lake	1
canadian car & foundry	1
republic	1
lingwall	1
piccard	1
todd	1
diamond aircraft industries	1
yakovlev	1
omf	1
barr	1
taylorcraft	1
eagle balloons	1
john hubbard	1
learjet	1
us/lta	1
robinson	1
gates lear jet	1
quickie	1
bensen	1
burkhart grob	1
smith, ted aerostar	1
fitz	1
bushby	1
british aerospace	1
fantasy sky promotions	1
mcdonnell douglas	1
wayne hooks	1
franz	1
crozier	1
quicksilver	1
general balloon	1
douglas swanningson	1
mbb	1
dassault-breguet	1
bok	1
shanklin	1
saloff	1
boeing stearman	1

head balloons, inc.	1
eiriavion oy	1
stevens	1
temco	1
raytheon	1
billings/humbyrd	1
globe	1
robertson	1
great lakes	1
sikorsky	1
wizard	1
galaxy	1
morrison	1
powrachute corp.	1
hoac austria	1
homebuilt	1
liberty aerospace, inc.	1
colonial	1
kenneth miller	1
pterodactyl	2
dassault	2
fairchild	2
cirrus design corp.	2
dassault aviation	2
gulfstream aerospace	2
sukhoi	2
schleicher	2
grumman american	2
aerostar	2
schempp-hirth	2
champion	2
gates learjet	2
lockheed	2
mitsubishi	3
cameron	3
douglas	3
waco	3
israel aircraft industries	3
enstrom	3
hughes	3
grumman	4
aeronca	4
canadair	4
pitts	4
bellanca	4
bell	5
schweizer	5
stinson	5
rockwell	7

```
                    raven                     7
              de havilland                    7
             balloon works                    9
            north american                   11
                   boeing                    11
                   mooney                    21
                    beech                    38
                    piper                    64
                   cessna                   127
```

From the above inf there are a number of aircrafts with only 1 minor accident while the most was the Cessna Aircraft

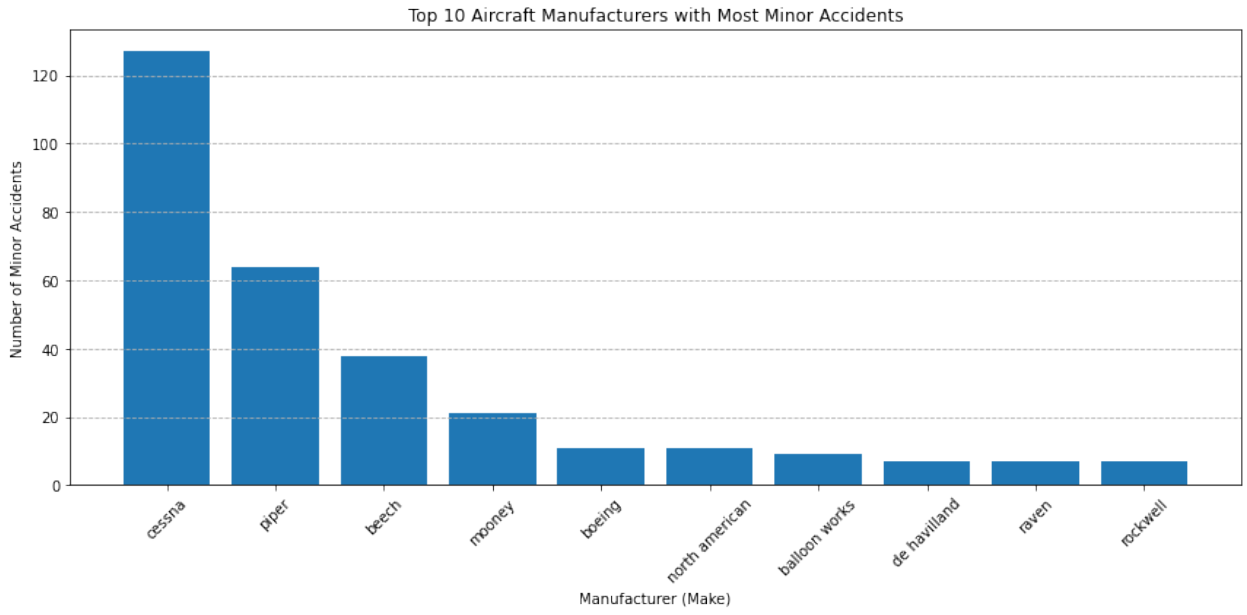
A visualization was done to show the distribution in form of a bar graph of the top 10 Makes with the most minor accidents

```
top_10_minor = df['Make'].value_counts().nlargest(10).reset_index()
top_10_minor.columns = ['Make', 'Minor_Accidents_Count']

plt.figure(figsize=(12, 6))
bars = plt.bar(top_10_minor['Make'],
top_10_minor['Minor_Accidents_Count'],)

plt.title('Top 10 Aircraft Manufacturers with Most Minor Accidents')
plt.xlabel('Manufacturer (Make)')
plt.ylabel('Number of Minor Accidents')
plt.xticks(rotation=45)
plt.grid(axis='y', linestyle='--')

plt.tight_layout()
plt.show()
```



After remaining with only aircrafts with minor damage, the next step was to filter all airplanes that had ever caused a fatality of more than 15 during time of service

```
# Group by Make and sum the total injuries
make_injuries = df.groupby('Make')['tot_injuries'].sum().reset_index()

# Filter out Makes with more than 15 total injuries
filtered_makes = make_injuries[make_injuries['tot_injuries'] <= 15]
['Make']

filtered_df = df[df['Make'].isin(filtered_makes)]


print(f"Original: {df.shape}")
print(f"Filtered ): {filtered_df.shape}")


Original: (464, 11)
Filtered ): (337, 11)

filtered_df

       Event.Date        Location           Make                   Model
\
23     1982-01-03    VAN NUYS, CA         piper               PA-24-180

40     1982-01-05   PENSACOLA, FL      rockwell                     114

119    1982-01-19  WASHINGTON, DC  de havilland              DHC-6-300

131    1982-01-20    SAN JOSE, CA         piper               PA-31-350

194    1982-01-30     TRUCKEE, CA         piper             PA-28R-201T

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

63182  2007-08-15       Alton, IL         piper             PA-32R-301T

63347  2007-09-08   Kerrville, TX        mooney                  M20TN

63490  2007-10-02     Ashland, KY       degelia  Rotor Flight Dynamic

63519  2007-10-06    El Cajon, CA      yakovlev                 YAK-50

63896  2007-12-26       Aspen, CO         piper              PA-46-310P


         Purpose.of.flight Aircraft.damage Injury.Severity
Amateur.Built  \
23                Personal           Minor        Incident
No
```

```
40                Business           Minor        Incident
No
119                  Ferry           Minor        Incident
No
131    Executive/corporate           Minor        Incident
No
194               Personal           Minor        Incident
No
...                    ...             ...             ...            .
..
63182             Business           Minor        Incident
No
63347             Personal           Minor        Incident
No
63490             Personal           Minor       Non-Fatal
Yes
63519             Personal           Minor       Non-Fatal
No
63896             Personal           Minor        Incident
No

         Engine.Type Broad.phase.of.flight  tot_injuries
23     Reciprocating              Approach           0.0
40     Reciprocating                Cruise           0.0
119       Turbo Prop               Descent           0.0
131    Reciprocating               Takeoff           0.0
194    Reciprocating               Landing           0.0
...              ...                   ...           ...
63182  Reciprocating               Descent           0.0
63347  Reciprocating               Landing           0.0
63490  Reciprocating               Landing           0.0
63519  Reciprocating               Landing           0.0
63896  Reciprocating                 Climb           0.0

[337 rows x 11 columns]
```

Cost of Operation

Since the goal of Medsoar limited while entering the airplane business is to have the lowest risk for the company. All amateur builds that were 'yes' were dropped since it will be difficult to fix the plane/ have insurance for the plane since they are not certified builders of planes

Additionaly all accidents that occcured before 1990 were dropped since the planes will be too old now to buy and expensive to maintain

```
df = df.copy()
df.loc[:, 'Event.Date'] = pd.to_datetime(df['Event.Date'])
```

```
df = df[df['Event.Date'].dt.year >= 1990].copy()
df
```

```
      Event.Date           Location        Make                  Model
\
24854 1990-02-04        TOMBALL, TX      cessna                   150M

25046 1990-03-11     TITUSVILLE, FL     stinson                  AT-19

25131 1990-03-25        AUGUSTA, GA      mooney                  M-20L

25482 1990-05-15  DAYTONA BEACH, FL      boeing                  A75N1

25517 1990-05-20  COEUR D'ALENE, ID  swearingen              SA226-T(B)

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

63182 2007-08-15          Alton, IL       piper             PA-32R-301T

63347 2007-09-08      Kerrville, TX      mooney                  M20TN

63490 2007-10-02        Ashland, KY     degelia  Rotor Flight Dynamic

63519 2007-10-06       El Cajon, CA    yakovlev                 YAK-50

63896 2007-12-26          Aspen, CO       piper             PA-46-310P


      Purpose.of.flight Aircraft.damage Injury.Severity Amateur.Built
\
24854          Personal           Minor        Fatal(1)             No

25046          Personal           Minor        Incident             No

25131          Personal           Minor        Incident             No

25482          Personal           Minor       Non-Fatal             No

25517          Personal           Minor        Fatal(1)             No

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

63182          Business           Minor        Incident             No

63347          Personal           Minor        Incident             No

63490          Personal           Minor       Non-Fatal            Yes

63519          Personal           Minor       Non-Fatal             No

63896          Personal           Minor        Incident             No
```

```
         Engine.Type Broad.phase.of.flight  tot_injuries
24854  Reciprocating              Approach           1.0
25046  Reciprocating               Takeoff           0.0
25131  Reciprocating               Takeoff           0.0
25482  Reciprocating                  Taxi           0.0
25517     Turbo Prop                  Taxi           1.0
...              ...                   ...           ...
63182  Reciprocating               Descent           0.0
63347  Reciprocating               Landing           0.0
63490  Reciprocating               Landing           0.0
63519  Reciprocating               Landing           0.0
63896  Reciprocating                 Climb           0.0

[215 rows x 11 columns]
```

```
df=df[df['Amateur.Built']=='No']
df
```

```
      Event.Date           Location              Make         Model  \
24854 1990-02-04        TOMBALL, TX            cessna          150M
25046 1990-03-11     TITUSVILLE, FL           stinson         AT-19
25131 1990-03-25        AUGUSTA, GA            mooney         M-20L
25482 1990-05-15  DAYTONA BEACH, FL            boeing         A75N1
25517 1990-05-20  COEUR D'ALENE, ID        swearingen    SA226-T(B)
...          ...                ...               ...           ...
63053 2007-07-28        Suffolk, VA  powrachute corp.  Pegasus 912M
63182 2007-08-15          Alton, IL             piper   PA-32R-301T
63347 2007-09-08      Kerrville, TX            mooney         M20TN
63519 2007-10-06       El Cajon, CA          yakovlev        YAK-50
63896 2007-12-26          Aspen, CO             piper    PA-46-310P

      Purpose.of.flight Aircraft.damage Injury.Severity Amateur.Built
\
24854          Personal           Minor        Fatal(1)             No

25046          Personal           Minor        Incident             No

25131          Personal           Minor        Incident             No

25482          Personal           Minor       Non-Fatal             No

25517          Personal           Minor        Fatal(1)             No

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

63053          Personal           Minor       Non-Fatal             No

63182          Business           Minor        Incident             No

63347          Personal           Minor        Incident             No
```

```
63519          Personal           Minor       Non-Fatal             No

63896          Personal           Minor        Incident             No


         Engine.Type Broad.phase.of.flight  tot_injuries
24854  Reciprocating               Approach           1.0
25046  Reciprocating                Takeoff           0.0
25131  Reciprocating                Takeoff           0.0
25482  Reciprocating                   Taxi           0.0
25517     Turbo Prop                   Taxi           1.0
...              ...                    ...           ...
63053  Reciprocating                  Climb           0.0
63182  Reciprocating                Descent           0.0
63347  Reciprocating                Landing           0.0
63519  Reciprocating                Landing           0.0
63896  Reciprocating                  Climb           0.0

[196 rows x 11 columns]
```

From the above Data 196 aircrafts generally fitted Medsoar limited goal for aircrafts with the lowest risk for the company

Most Common Engine Type

This was to aid in which engine was used with most of the makes which are least likely to have a serious accident

```
engine_type_counts =
df['Engine.Type'].value_counts(dropna=True).sort_values(ascending=Fals
e)

most_common_engine = engine_type_counts.index[0]
most_common_engine_count = engine_type_counts.iloc[0]

print(f"Most common Engine Type: {most_common_engine}")
print(f"Count:{most_common_engine_count} ")
print(engine_type_counts)
```

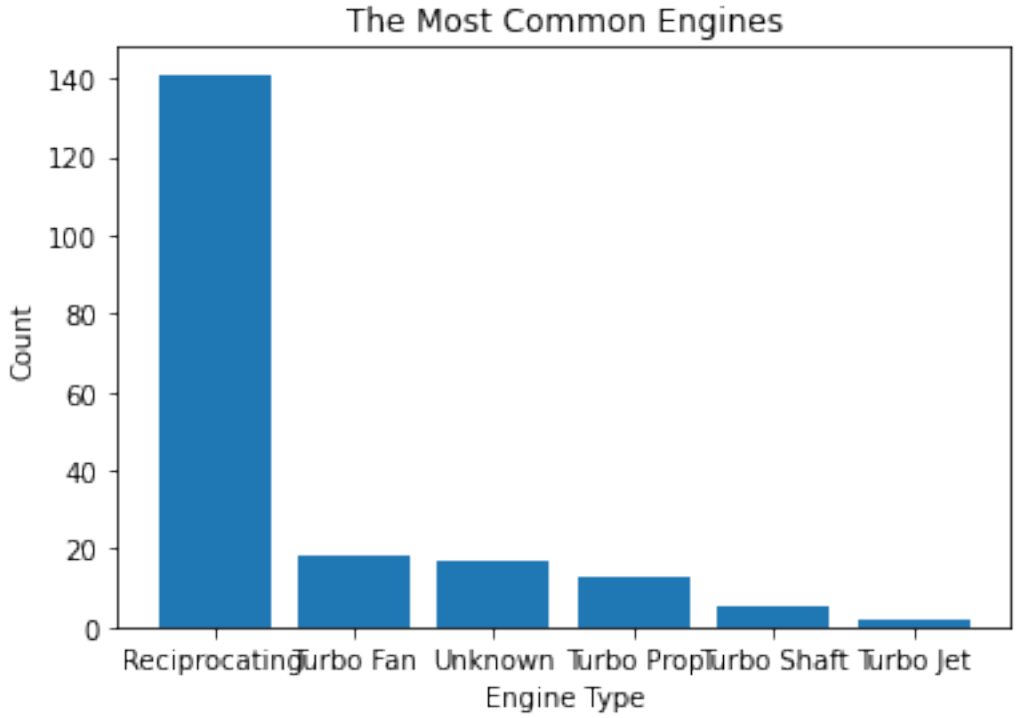
```
Most common Engine Type: Reciprocating
Count:141
Reciprocating    141
Turbo Fan         18
Unknown           17
Turbo Prop        13
```

```
Turbo Shaft        5
Turbo Jet          2
Name: Engine.Type, dtype: int64
```

Graph of the Most common Engine

```
bar_chart_title = "The Most Common Engines"

fig, ax = plt.subplots()
ax.bar(x=engine_type_counts.index, height=engine_type_counts)
ax.set_xlabel("Engine Type")
ax.set_ylabel("Count")
ax.set_title(bar_chart_title);
```



From the information the most common engine was found to be the reciprocating engine and hence the least crashed rate

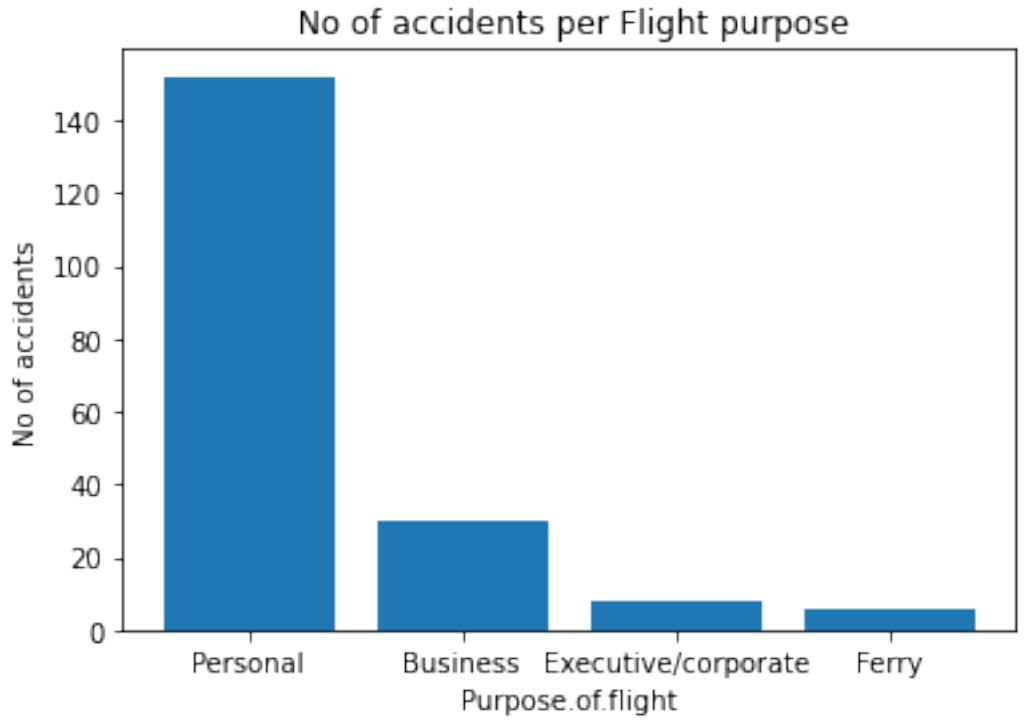
Number of Airplanes which meets the company function and their division

```
plane_purpose = df["Purpose.of.flight"].value_counts()
print(plane_purpose)
```

```
Personal                152
Business                 30
Executive/corporate       8
Ferry                     6
Name: Purpose.of.flight, dtype: int64

bar_chart_title = " No of accidents per Flight purpose"

fig, ax = plt.subplots()
ax.bar(x=plane_purpose.index, height=plane_purpose)
ax.set_xlabel("Purpose.of.flight")
ax.set_ylabel("No of accidents")
ax.set_title(bar_chart_title);
```



Recommendations

1) The best engine Type

the purpose of determining the engine type was to prevent the company from going for aeroplanes with the least reliable engines and the ones prone to regular accidents From the analysis it was determined that the Reciprocating engine was the best engine followed by the Turbo fan and the turbo prop engines. Choosing any of these engines was determined to reduce the company's risk in terms of failure and accidents hence reducing costs

2) Which Business venture should the company prioritize

The purpose of determining which airplane purpose had the least risk of an accident was important in determining which the direction the company will go From the data analysis the number of personal aircrafts had the most number of aaccidents hence I would recommend the company to reduce the private/personal ventures The commercial planes had the least accidents. This could be due to better servicing of the plane, better pilots and much more better plane equipments

3 Which aircraft was found to be the safest

A number of aircrafts were found to have a minor accident damage with the least number of total injuries but the one that stood out is the Cessna, Piper and Beech airplanes which rarely had substansial damages after an accident or a high number of total injuries exceding 15

```
# Changing filtered information to excel for use in tableu
df.to_excel('./data/Filtered_Aviation_Data.xlsx',index=False)
```