In [2]:

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

df = pd.read_csv('final_dataset.csv', encoding = "latin-1")

df
```

```
/var/folders/m7/tzk7gpbd05j79z_hsb25z6jm0000gn/T/ipykernel_8367
9/1381291812.py:7: DtypeWarning: Columns (19) have mixed types.
Specify dtype option on import or set low_memory=False.
  df = pd.read_csv('final_dataset.csv', encoding = "latin-1")
```

Out[2]:

	Unnamed: 0	Investigation.Type	Event.Date	Location	Country	Injury.Severity
0	0	Accident	1948-10-24	MOOSE CREEK, ID	United States	Fatal(2)
1	1	Accident	1962-07-19	BRIDGEPORT, CA	United States	Fatal(4)
2	2	Accident	1974-08-30	Saltville, VA	United States	Fatal(3)
3	3	Accident	1977-06-19	EUREKA, CA	United States	Fatal(2)

In [3]:

```
drop_unnamed = ['Unnamed: 0']

df = df.drop(columns=drop_unnamed)
```

In [4]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 88889 entries, 0 to 88888
Data columns (total 20 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Investigation.Type      88889 non-null  object 
 1   Event.Date              88889 non-null  object 
 2   Location                88837 non-null  object 
 3   Country                 88663 non-null  object 
 4   Injury.Severity         87889 non-null  object 
 5   Aircraft.damage         85695 non-null  object 
 6   Aircraft.Category       32287 non-null  object 
 7   Make                    88826 non-null  object 
 8   Model                   88797 non-null  object 
 9   Amateur.Built           88787 non-null  object 
 10  Number.of.Engines       82805 non-null  float64
 11  Engine.Type             81793 non-null  object 
 12  Purpose.of.flight       82697 non-null  object 
 13  Total.Fatal.Injuries    77488 non-null  float64
 14  Total.Serious.Injuries  76379 non-null  float64
 15  Total.Minor.Injuries    76956 non-null  float64
 16  Total.Uninjured         82977 non-null  float64
 17  Weather.Condition       84397 non-null  object 
 18  Broad.phase.of.flight   61724 non-null  object 
 19  Report.Status           82505 non-null  object 
dtypes: float64(5), object(15)
memory usage: 13.6+ MB
```

eventdate_isna = df['Event.Date'].isna().value_counts() eventdate_isna

Took the 'Event.Date' column and separating the Year and Month to look at the data year over year, which months have the most quantitative data.

In [5]:

```
df['Event.Date'] = pd.to_datetime(df['Event.Date'])

df['Year'] = df['Event.Date'].dt.year
df['Month'] = df['Event.Date'].dt.month

print(df[['Event.Date', 'Year', 'Month']])
```

```
      Event.Date  Year  Month
0     1948-10-24  1948     10
1     1962-07-19  1962      7
2     1974-08-30  1974      8
3     1977-06-19  1977      6
4     1979-08-02  1979      8
...          ...   ...    ...
88884 2022-12-26  2022     12
88885 2022-12-26  2022     12
88886 2022-12-26  2022     12
88887 2022-12-26  2022     12
88888 2022-12-29  2022     12

[88889 rows x 3 columns]
```

In [6]:

```
invest_type_vc = df['Investigation.Type'].value_counts()
print(invest_type_vc)
```

```
Investigation.Type
Accident    85015
Incident     3874
Name: count, dtype: int64
```

99.6% of the data shows the events recorded were 'Accident' related. Consider not using the rows containing 'Incident'. Looking at how many of the other quantitative columns would be seriously impacted if we decided not to use 'Incident' related events.

In [7]:

```
df.select_dtypes(include=[np.number]).mean()
```

Out[7]:

```
Number.of.Engines            1.146585
Total.Fatal.Injuries         0.647855
Total.Serious.Injuries       0.279881
Total.Minor.Injuries         0.357061
Total.Uninjured              5.325440
Year                      1999.206662
Month                        6.591221
dtype: float64
```

In [8]:
```
df.select_dtypes(include=[np.number]).std()
```

Out[8]:
```
Number.of.Engines          0.446510
Total.Fatal.Injuries       5.485960
Total.Serious.Injuries     1.544084
Total.Minor.Injuries       2.235625
Total.Uninjured           27.913634
Year                      11.888226
Month                      3.062868
dtype: float64
```

In [66]:
```
df = pd.read_csv('final_dataset.csv', encoding = "latin-1")
```

```
/var/folders/m7/tzk7gpbd05j79z_hsb25z6jm0000gn/T/ipykernel_83679/16
86955178.py:1: DtypeWarning: Columns (19) have mixed types. Specify
dtype option on import or set low_memory=False.
  df = pd.read_csv('final_dataset.csv', encoding = "latin-1")
```

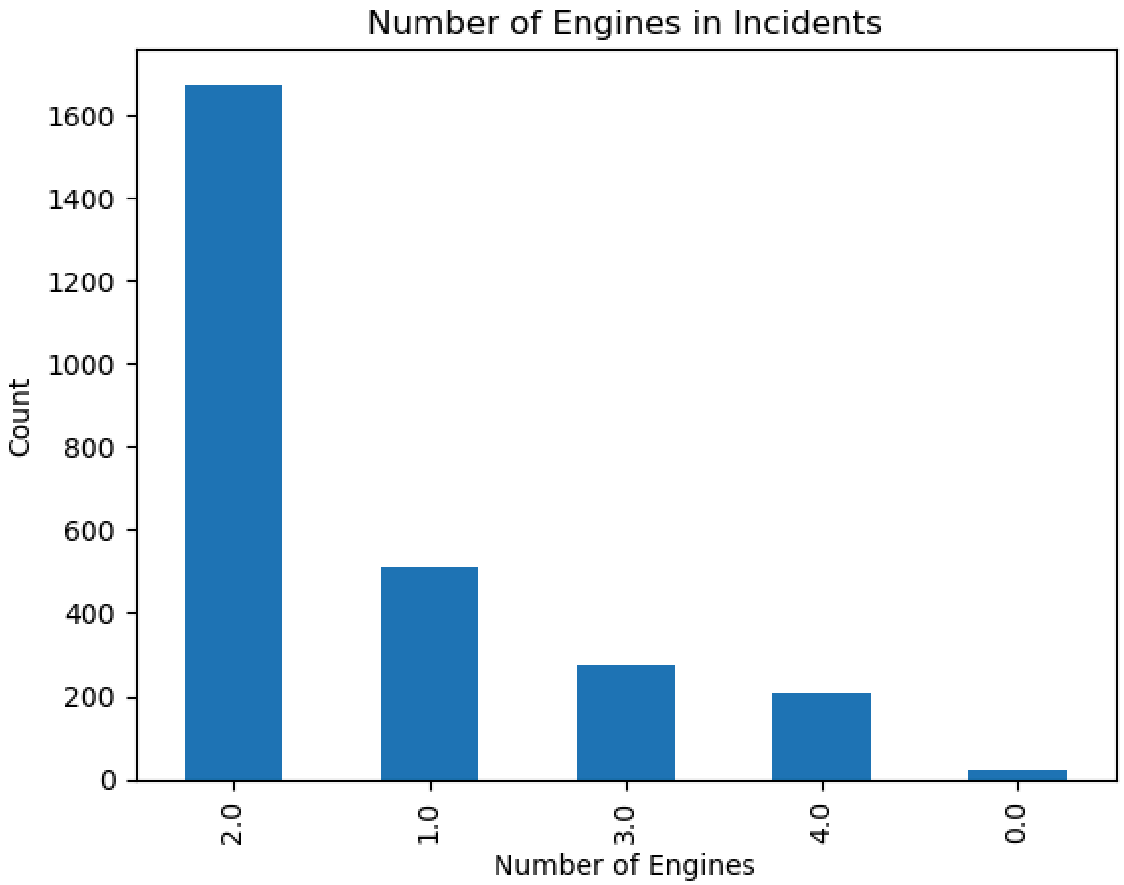
In [67]:
```
incidents_df = df[df['Investigation.Type'] == 'Incident']
```

In [69]:
```
print(incidents_df['Number.of.Engines'].value_counts())
```

```
Number.of.Engines
2.0    1674
1.0     513
3.0     276
4.0     206
0.0      21
Name: count, dtype: int64
```

In [70]:

```
incidents_df['Number.of.Engines'].value_counts().plot(kind='bar', tit
plt.xlabel('Number of Engines')
plt.ylabel('Count')
plt.show()
```

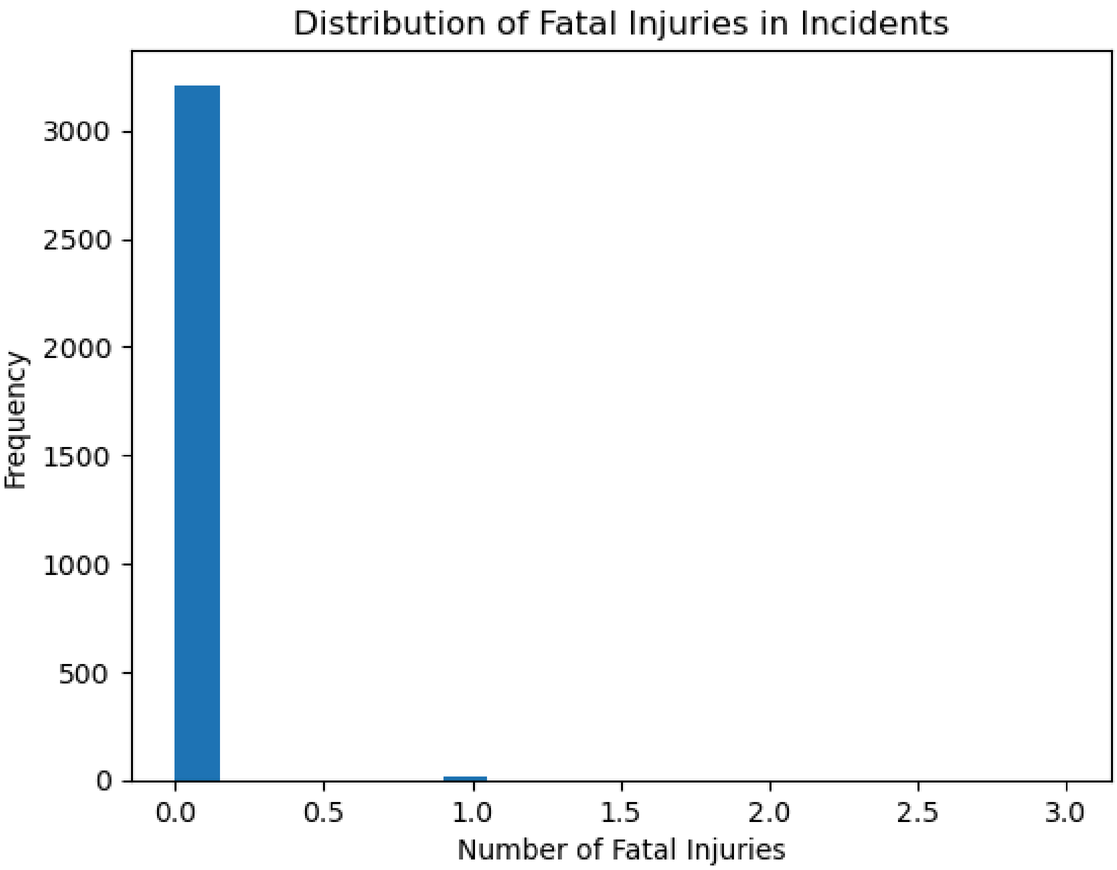


In [71]:

```
print(incidents_df['Total.Fatal.Injuries'].describe())
```

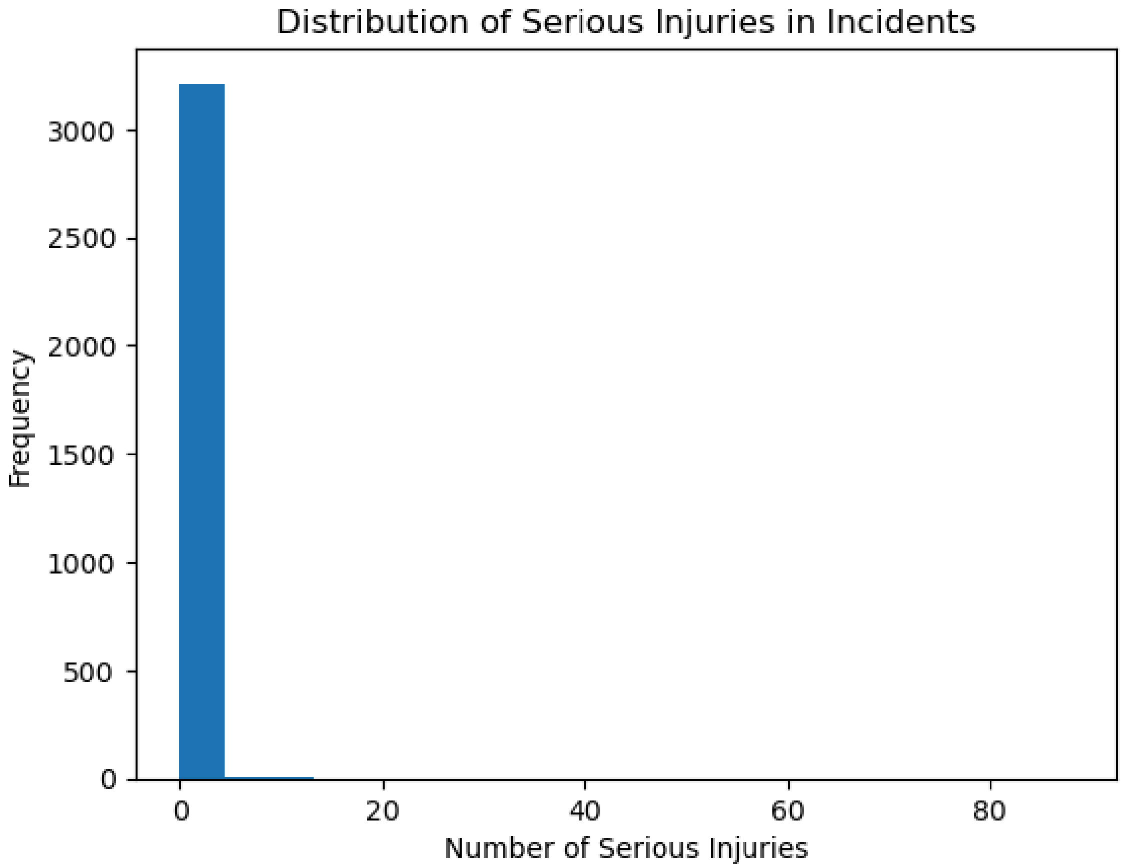
```
count    3229.000000
mean        0.006813
std         0.096163
min         0.000000
25%         0.000000
50%         0.000000
75%         0.000000
max         3.000000
Name: Total.Fatal.Injuries, dtype: float64
```

```
In [72]: incidents_df['Total.Fatal.Injuries'].plot(kind='hist', bins=20, title
         plt.xlabel('Number of Fatal Injuries')
         plt.ylabel('Frequency')
         plt.show()
```



In [73]:
```
print(incidents_df['Total.Serious.Injuries'].describe())
incidents_df['Total.Serious.Injuries'].plot(kind='hist', bins=20, tit
plt.xlabel('Number of Serious Injuries')
plt.ylabel('Frequency')
plt.show()
```

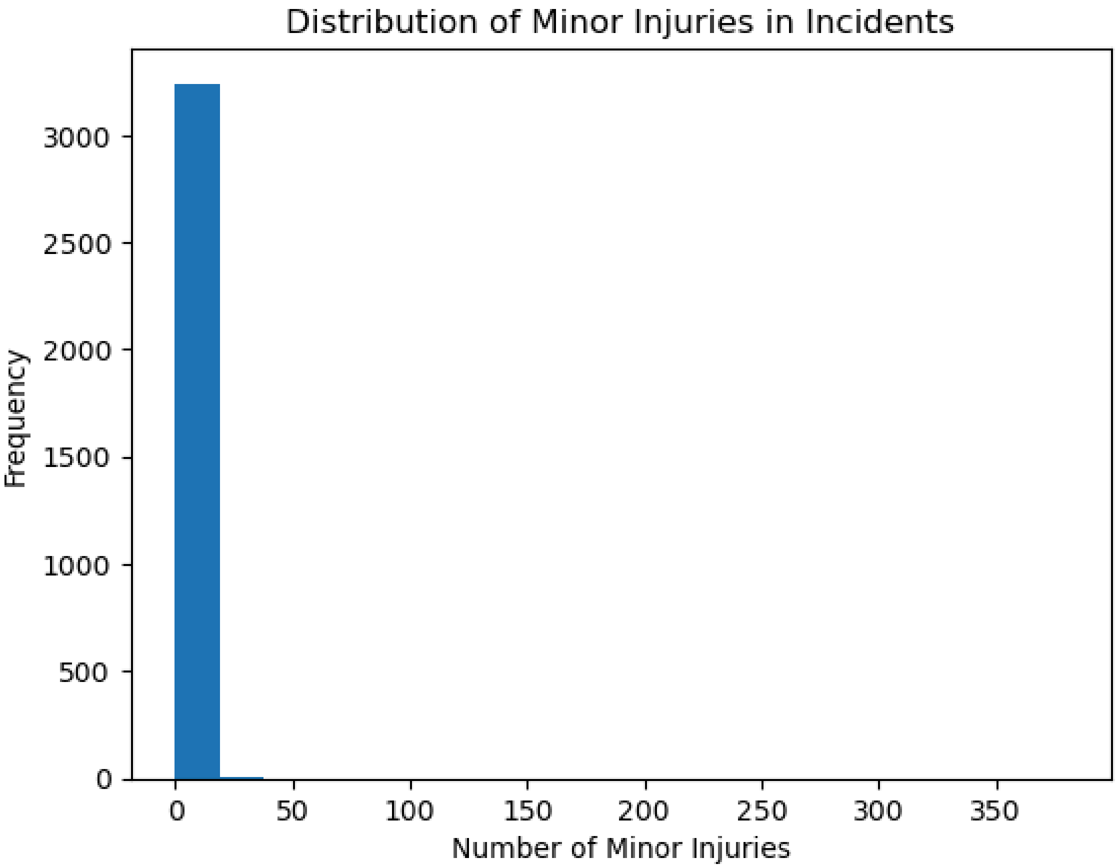
```
count    3227.000000
mean        0.094825
std         1.800925
min         0.000000
25%         0.000000
50%         0.000000
75%         0.000000
max        88.000000
Name: Total.Serious.Injuries, dtype: float64
```



In [74]:

```
print(incidents_df['Total.Minor.Injuries'].describe())
incidents_df['Total.Minor.Injuries'].plot(kind='hist', bins=20, title
plt.xlabel('Number of Minor Injuries')
plt.ylabel('Frequency')
plt.show()
```

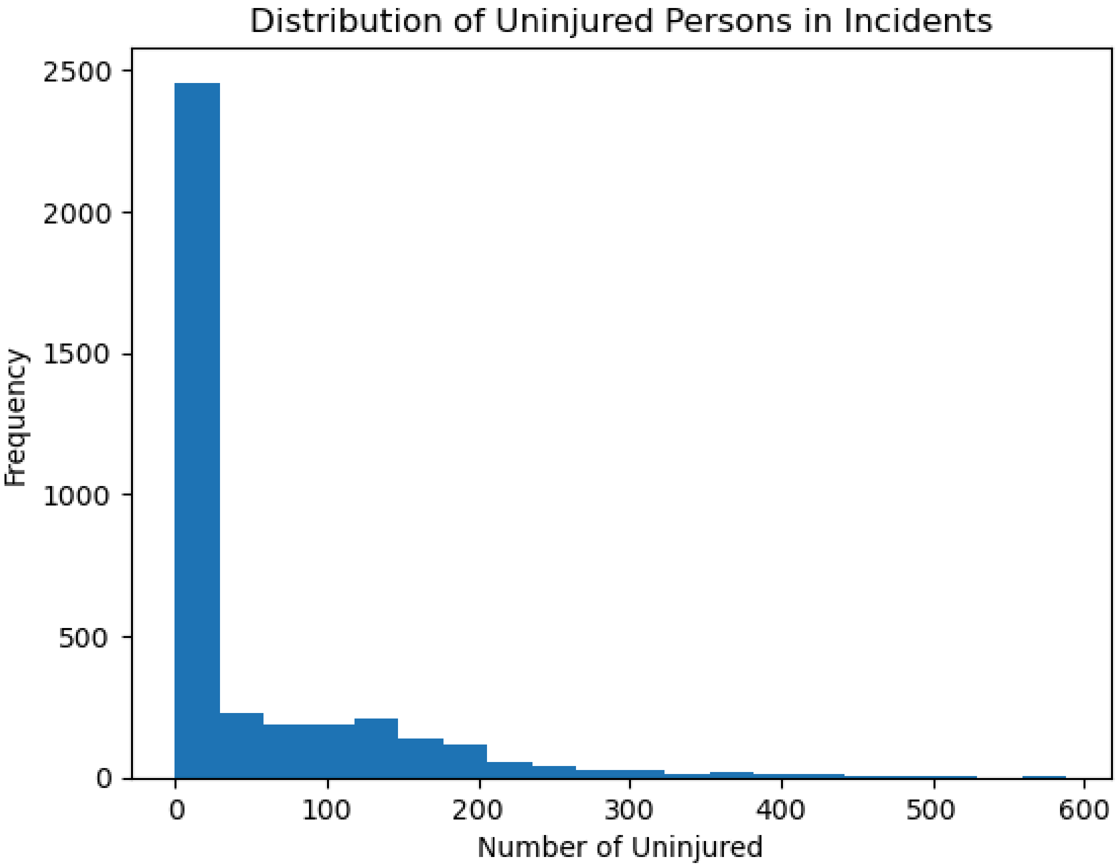
```
count    3250.000000
mean        0.363692
std         6.920471
min         0.000000
25%         0.000000
50%         0.000000
75%         0.000000
max       380.000000
Name: Total.Minor.Injuries, dtype: float64
```



In [75]:

```
print(incidents_df['Total.Uninjured'].describe())
incidents_df['Total.Uninjured'].plot(kind='hist', bins=20, title='Dis
plt.xlabel('Number of Uninjured')
plt.ylabel('Frequency')
plt.show()
```

```
count    3730.000000
mean       50.111260
std        83.380418
min         0.000000
25%         1.000000
50%         4.000000
75%        78.000000
max       588.000000
Name: Total.Uninjured, dtype: float64
```

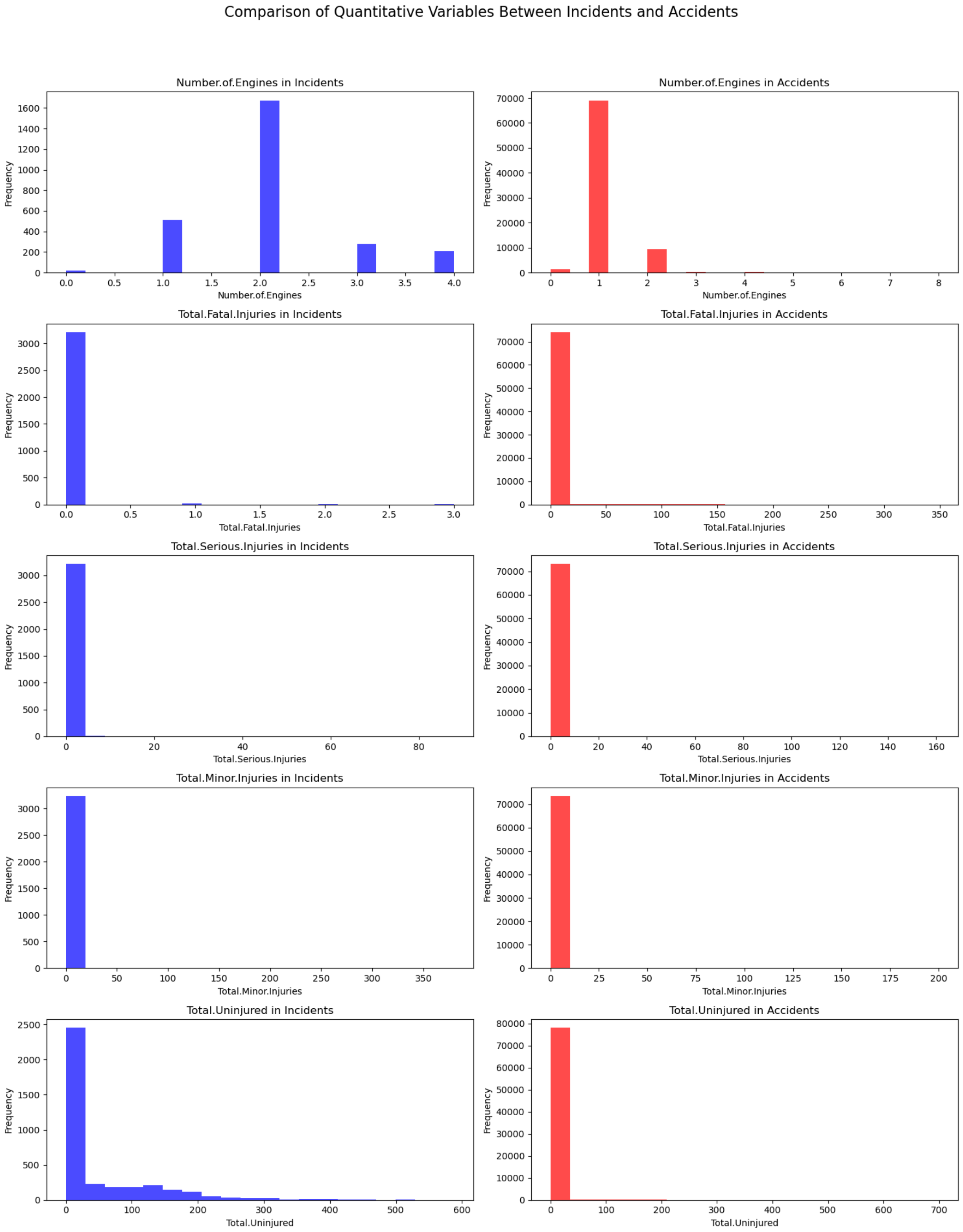


In [76]:

```
accidents_df = df[df['Investigation.Type'] == 'Accident']
```

In [77]:

```
columns_to_plot = ['Number.of.Engines', 'Total.Fatal.Injuries',
                   'Total.Serious.Injuries', 'Total.Minor.Injuries',

fig, axes = plt.subplots(len(columns_to_plot), 2, figsize=(15, 20), s

for i, col in enumerate(columns_to_plot):

    incidents_df[col].plot(kind='hist', bins=20, ax=axes[i, 0], color
    axes[i, 0].set_xlabel(col)
    axes[i, 0].set_ylabel('Frequency')

    accidents_df[col].plot(kind='hist', bins=20, ax=axes[i, 1], color
    axes[i, 1].set_xlabel(col)
    axes[i, 1].set_ylabel('Frequency')

fig.suptitle('Comparison of Quantitative Variables Between Incidents
plt.tight_layout(rect=[0, 0.03, 1, 0.95])
plt.show()
```



In [78]:

```
df = df[df['Investigation.Type'] != 'Incident']
print(df['Investigation.Type'].value_counts())
```

```
Investigation.Type
Accident    85015
Name: count, dtype: int64
```

In [79]:
```
location_vc = df['Location'].value_counts()
print(location_vc)
```

```
Location
ANCHORAGE, AK            405
ALBUQUERQUE, NM          192
HOUSTON, TX              174
FAIRBANKS, AK            169
MIAMI, FL                158
                        ... 
SHIELDS, KS                1
TRINIDAD, West Indies      1
GULF OF CA                 1
ZAVALLA, TX                1
Brasnorte,                 1
Name: count, Length: 26903, dtype: int64
```

In [80]:
```
location_unq = df['Location'].unique()
location_unq
```

Out[80]:
```
array(['MOOSE CREEK, ID', 'BRIDGEPORT, CA', 'Saltville, VA', ...,
       'San Manual, AZ', 'Auburn Hills, MI', 'Brasnorte, '], dtype=
object)
```

In [81]:
```
loc_unq_count = df['Location'].nunique()
print(loc_unq_count)
```

```
26903
```

In [82]:
```
df.drop(['Unnamed: 0', 'Location'], axis=1)
```

Out[82]:

	Investigation.Type	Event.Date	Country	Injury.Severity	Aircraft.damage	Aircraft.Catego
0	Accident	1948-10-24	United States	Fatal(2)	Destroyed	N
1	Accident	1962-07-19	United States	Fatal(4)	Destroyed	N
2	Accident	1974-08-30	United States	Fatal(3)	Destroyed	N
3	Accident	1977-06-19	United States	Fatal(2)	Destroyed	N
4	Accident	1979-08-02	United States	Fatal(1)	Destroyed	N
...	...	...	...	...	...	
88884	Accident	2022-12-26	United States	Minor	NaN	N
88885	Accident	2022-12-26	United States	NaN	NaN	N
88886	Accident	2022-12-26	United States	Non-Fatal	Substantial	Airpla
88887	Accident	2022-12-26	United States	NaN	NaN	N
88888	Accident	2022-12-29	United States	Minor	NaN	N

85015 rows × 19 columns

In [83]:
```
country_vc = df['Country'].value_counts()
country_vc
```

Out[83]:
```
Country
United States     79906
Brazil              331
Canada              312
Mexico              291
United Kingdom      221
                  ...  
Guam                  1
Ivory Coast           1
Malampa               1
AY                    1
Cambodia              1
Name: count, Length: 209, dtype: int64
```

In [84]:
```
country_unq_count = df['Country'].nunique()
print(country_unq_count)
```

```
209
```

In [85]:
```
aircraft_dam_vc = df['Aircraft.damage'].value_counts()
aircraft_dam_vc
```

Out[85]:
```
Aircraft.damage
Substantial    64106
Destroyed      18615
Minor            737
Unknown           97
Name: count, dtype: int64
```

In [86]:
```
aircraft_dam_uk = df[df['Aircraft.damage'] == 'Unknown']
```

In [87]:
```
print(aircraft_dam_uk['Total.Minor.Injuries'].value_counts())
```

```
Total.Minor.Injuries
0.0    83
1.0     9
2.0     3
3.0     1
7.0     1
Name: count, dtype: int64
```

In [88]:
```
df = df[df['Aircraft.damage'] != 'Unknown']
print(df['Aircraft.damage'].value_counts())
```

```
Aircraft.damage
Substantial    64106
Destroyed      18615
Minor            737
Name: count, dtype: int64
```

In [89]:
```
aircraft_dam_nan = df['Aircraft.damage'].isna().value_counts()
print(aircraft_dam_nan)
```

```
Aircraft.damage
False    83458
True      1460
Name: count, dtype: int64
```

In [90]:
```
col_list = ['Aircraft.damage', 'Total.Fatal.Injuries', 'Total.Serious
selection = df.loc[df.notna().all(axis=1), col_list]

selection.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 3475 entries, 7 to 63908
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype  
---  ------                  --------------  -----  
 0   Aircraft.damage         3475 non-null   object 
 1   Total.Fatal.Injuries    3475 non-null   float64
 2   Total.Serious.Injuries  3475 non-null   float64
 3   Total.Minor.Injuries    3475 non-null   float64
 4   Total.Uninjured         3475 non-null   float64
dtypes: float64(4), object(1)
memory usage: 162.9+ KB
```

In [91]:
```
df['Aircraft.damage'] = df['Aircraft.damage'].apply(lambda x: np.ranc
```

In [92]:
```
aircraft_dam_nan = df['Aircraft.damage'].isna().value_counts()
print(aircraft_dam_nan)
```

```
Aircraft.damage
False    84918
Name: count, dtype: int64
```

In [93]:
```
print(df['Aircraft.damage'].value_counts())
```

```
Aircraft.damage
Substantial    65268
Destroyed      18913
Minor            737
Name: count, dtype: int64
```

In [94]:

```
make_vc = df['Make'].value_counts()
make_vc.head(50)
```

Out[94]:

```
Make
Cessna                            21973
Piper                             11885
CESSNA                             4785
Beech                              4170
PIPER                              2785
Bell                               2093
Grumman                            1080
Mooney                             1074
BEECH                              1005
Robinson                            943
Boeing                              916
Bellanca                            883
Hughes                              790
Schweizer                           627
Air Tractor                         593
BELL                                564
Aeronca                             484
Maule                               443
BOEING                              443
Champion                            427
Aero Commander                      353
Stinson                             345
De Havilland                        342
Rockwell                            325
Taylorcraft                         321
Luscombe                            319
Aerospatiale                        313
Hiller                              310
Mcdonnell Douglas                   307
North American                      300
ROBINSON                            272
Enstrom                             242
MOONEY                              234
Grumman American                    223
ROBINSON HELICOPTER                 220
Ayres                               214
AIR TRACTOR INC                     214
CIRRUS DESIGN CORP                  206
Douglas                             176
ROBINSON HELICOPTER COMPANY         174
BELLANCA                            157
Ercoupe (eng & Research Corp.)      156
Sikorsky                            150
AERONCA                             149
MAULE                               144
SCHWEIZER                           141
Pitts                               141
Balloon Works                       137
HUGHES                              135
Lake                                135
Name: count, dtype: int64
```

In [95]:

```
make_nan = df['Make'].isna().value_counts()
print(make_nan)
```

```
Make
False    84882
True        36
Name: count, dtype: int64
```

In [96]:

```
make_unq = df['Make'].nunique()
make_unq
```

Out[96]:

```
8161
```

In [97]:

```
df.dropna(subset='Make', inplace=True)
```

In [98]:

```
make_nan = df['Make'].isna().value_counts()
print(make_nan)
```

```
Make
False    84882
Name: count, dtype: int64
```

In [99]:
```
model_vc = df['Model'].value_counts()
model_vc.head(50)
```

Out[99]:
```
Model
152           2347
172           1744
172N          1161
PA-28-140      928
150            821
172M           791
172P           685
182            651
180            620
150M           583
PA-18          581
PA-18-150      578
PA-28-180      570
PA-28-161      565
PA-28-181      528
206B           521
PA-38-112      465
G-164A         460
150L           459
A36            446
G-164B         420
140            402
170B           389
206            374
172S           361
R44            355
PA-32-300      352
182P           350
PA-24-250      349
269C           340
PA-28R-200     328
PA-12          322
A188B          316
PA-23-250      306
177            296
7AC            294
A185F          283
M20J           280
185            280
PA-22-150      280
7GCBC          277
PA28           272
R22            272
SR22           271
7ECA           267
182Q           266
150F           263
PA-25-235      260
PA-31-350      259
210            258
Name: count, dtype: int64
```

In [100]:

```
model_nan = df['Model'].isna().value_counts()
model_nan
```

Out[100]:

```
Model
False    84840
True        42
Name: count, dtype: int64
```

In [101]:

```
df.dropna(subset='Model', inplace=True)
```

In [102]:

```
model_nan = df['Model'].isna().value_counts()
model_nan
```

Out[102]:

```
Model
False    84840
Name: count, dtype: int64
```

In [103]:

```
model_unq = df['Model'].nunique()
model_unq
```

Out[103]:

```
11759
```

In [104]:

```
amateur_blt_vc = df['Amateur.Built'].value_counts()
amateur_blt_vc
```

Out[104]:

```
Amateur.Built
No     76387
Yes     8397
Name: count, dtype: int64
```

In [105]:

```
amateur_built_nan = df['Amateur.Built'].isna().value_counts()
amateur_built_nan
```

Out[105]:

```
Amateur.Built
False    84784
True        56
Name: count, dtype: int64
```

In [106]:

```
amateur_blt_df = df[df['Amateur.Built'] == 'Yes']
```

In [107]:

```
print(amateur_blt_df['Number.of.Engines'].value_counts())
```

```
Number.of.Engines
1.0    7976
2.0      73
0.0      64
4.0       1
3.0       1
Name: count, dtype: int64
```

In [108]:

```
print(amateur_blt_df['Total.Fatal.Injuries'].value_counts())
```

```
Total.Fatal.Injuries
0.0     4896
1.0     1705
2.0      570
3.0       38
4.0       14
7.0        4
5.0        4
6.0        2
8.0        1
35.0       1
18.0       1
Name: count, dtype: int64
```

In [109]:

```
print(amateur_blt_df['Total.Serious.Injuries'].value_counts())
```

```
Total.Serious.Injuries
0.0    5452
1.0    1366
2.0     240
3.0      16
4.0       3
5.0       2
Name: count, dtype: int64
```

In [110]:

```
print(amateur_blt_df['Total.Minor.Injuries'].value_counts())
```

```
Total.Minor.Injuries
0.0     5491
1.0     1367
2.0      255
3.0       12
4.0        4
5.0        3
68.0       1
Name: count, dtype: int64
```

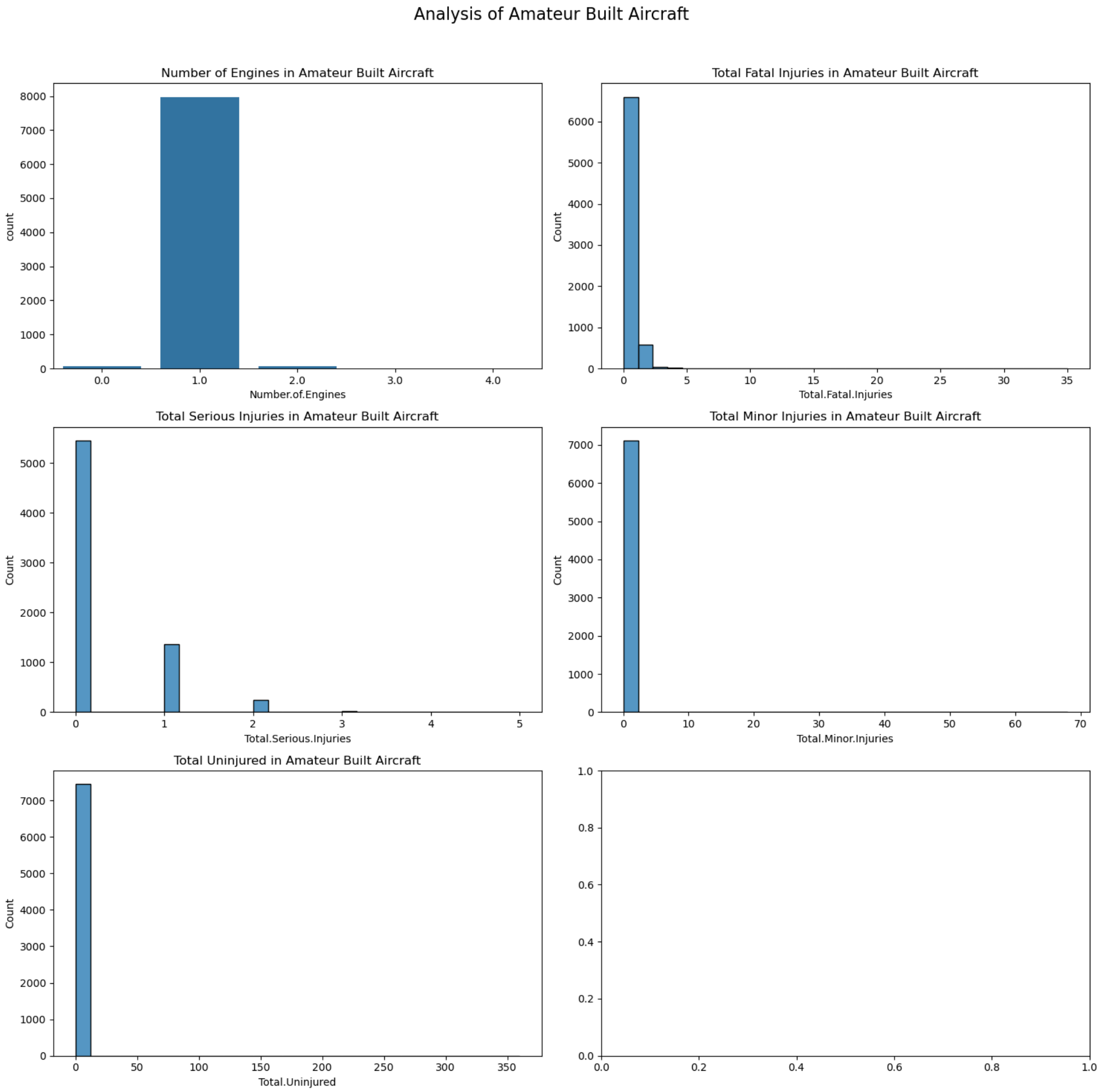
In [111]:

```
print(amateur_blt_df['Total.Uninjured'].value_counts())
```

```
Total.Uninjured
0.0      4051
1.0      2377
2.0       918
3.0        67
4.0        19
5.0         6
6.0         1
175.0       1
71.0        1
360.0       1
213.0       1
7.0         1
153.0       1
46.0        1
10.0        1
8.0         1
137.0       1
9.0         1
160.0       1
Name: count, dtype: int64
```

In [112]:

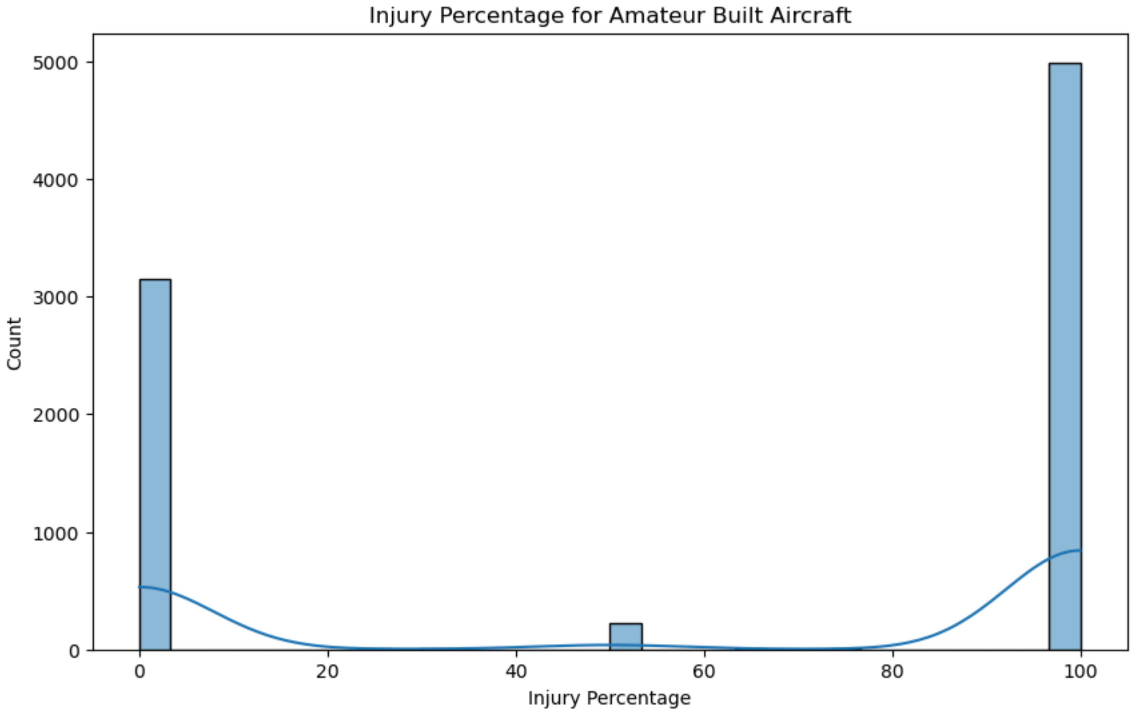
```
# Setting up the plots
fig, axes = plt.subplots(3, 2, figsize=(15, 15))  # Create a grid of
fig.suptitle('Analysis of Amateur Built Aircraft', fontsize=16)

# Plot Number of Engines
sns.countplot(ax=axes[0, 0], data=amateur_blt_df, x='Number.of.Engine
axes[0, 0].set_title('Number of Engines in Amateur Built Aircraft')

# Plot Total Fatal Injuries
sns.histplot(ax=axes[0, 1], data=amateur_blt_df, x='Total.Fatal.Injur
axes[0, 1].set_title('Total Fatal Injuries in Amateur Built Aircraft'

# Plot Total Serious Injuries
sns.histplot(ax=axes[1, 0], data=amateur_blt_df, x='Total.Serious.Inj
axes[1, 0].set_title('Total Serious Injuries in Amateur Built Aircraf

# Plot Total Minor Injuries
sns.histplot(ax=axes[1, 1], data=amateur_blt_df, x='Total.Minor.Injur
axes[1, 1].set_title('Total Minor Injuries in Amateur Built Aircraft'

# Plot Total Uninjured
sns.histplot(ax=axes[2, 0], data=amateur_blt_df, x='Total.Uninjured',
axes[2, 0].set_title('Total Uninjured in Amateur Built Aircraft')

# Adjust layout
plt.tight_layout(rect=[0, 0, 1, 0.96])
plt.show()
```


Analysis of Amateur Built Aircraft
Number of Engines in Amateur Built Aircraft
count
0
1000
2000
3000
4000
5000
6000
7000
8000
0.0
1.0
2.0
3.0
4.0
Number.of.Engines
Total Fatal Injuries in Amateur Built Aircraft
Count
0
1000
2000
3000
4000
5000
6000
0
5
10
15
20
25
30
35
Total.Fatal.Injuries
Total Serious Injuries in Amateur Built Aircraft
Count
0
1000
2000
3000
4000
5000
0
1
2
3
4
5
Total.Serious.Injuries
Total Minor Injuries in Amateur Built Aircraft
Count
0
1000
2000
3000
4000
5000
6000
7000
0
10
20
30
40
50
60
70
Total.Minor.Injuries
Total Uninjured in Amateur Built Aircraft
Count
0
1000
2000
3000
4000
5000
6000
7000
0
50
100
150
200
250
300
350
Total.Uninjured
0.0
0.2
0.4
0.6
0.8
1.0
0.0
0.2
0.4
0.6
0.8
1.0

In [113]:

```
# Sum of all injuries columns to get total injured
amateur_blt_df['Total.Injured'] = (
    amateur_blt_df['Total.Fatal.Injuries'].fillna(0) +
    amateur_blt_df['Total.Serious.Injuries'].fillna(0) +
    amateur_blt_df['Total.Minor.Injuries'].fillna(0)
)

# Calculate the percentage of total injured
amateur_blt_df['Injury.Percentage'] = (
    amateur_blt_df['Total.Injured'] /
    (amateur_blt_df['Total.Injured'] + amateur_blt_df['Total.Uninjure
) * 100

# Display the dataframe with new columns for review
print(amateur_blt_df[['Total.Injured', 'Total.Uninjured', 'Injury.Per

plt.figure(figsize=(10, 6))
sns.histplot(data=amateur_blt_df, x='Injury.Percentage', bins=30, kde
plt.title('Injury Percentage for Amateur Built Aircraft')
plt.xlabel('Injury Percentage')
plt.ylabel('Count')
plt.show()
```

```
     Total.Injured  Total.Uninjured  Injury.Percentage
45             0.0              3.0                0.0
73             0.0              1.0                0.0
99             1.0              0.0              100.0
124            1.0              0.0              100.0
143            1.0              0.0              100.0

/var/folders/m7/tzk7gpbd05j79z_hsb25z6jm0000gn/T/ipykernel_83679/11
89663532.py:2: 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/pan
das-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-
copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/index
ing.html#returning-a-view-versus-a-copy)
  amateur_blt_df['Total.Injured'] = (
/var/folders/m7/tzk7gpbd05j79z_hsb25z6jm0000gn/T/ipykernel_83679/11
89663532.py:9: 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/pan
das-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-
copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/index
ing.html#returning-a-view-versus-a-copy)
  amateur_blt_df['Injury.Percentage'] = (
```



In [114]:
```
purp_of_flight_vc = df['Purpose.of.flight'].value_counts()
purp_of_flight_vc
```

Out[114]:
```
Purpose.of.flight
Personal                     49114
Instructional                10463
Unknown                       5529
Aerial Application            4701
Business                      3899
Positioning                   1560
Other Work Use                1236
Aerial Observation             790
Ferry                          787
Public Aircraft                695
Executive/corporate            501
Flight Test                    392
Skydiving                      181
External Load                  122
Public Aircraft - Federal      103
Banner Tow                     101
Air Race show                   98
Public Aircraft - Local         72
Public Aircraft - State         62
Air Race/show                   59
Glider Tow                      53
Firefighting                    40
Air Drop                        11
ASHO                             6
PUBS                             4
PUBL                             1
Name: count, dtype: int64
```

In [115]:
```
purp_of_flight_unq = df['Purpose.of.flight'].nunique()
purp_of_flight_unq
```

Out[115]:
```
26
```

In [116]:
```
purp_of_flight_nan = df['Purpose.of.flight'].isna().value_counts()
purp_of_flight_nan
```

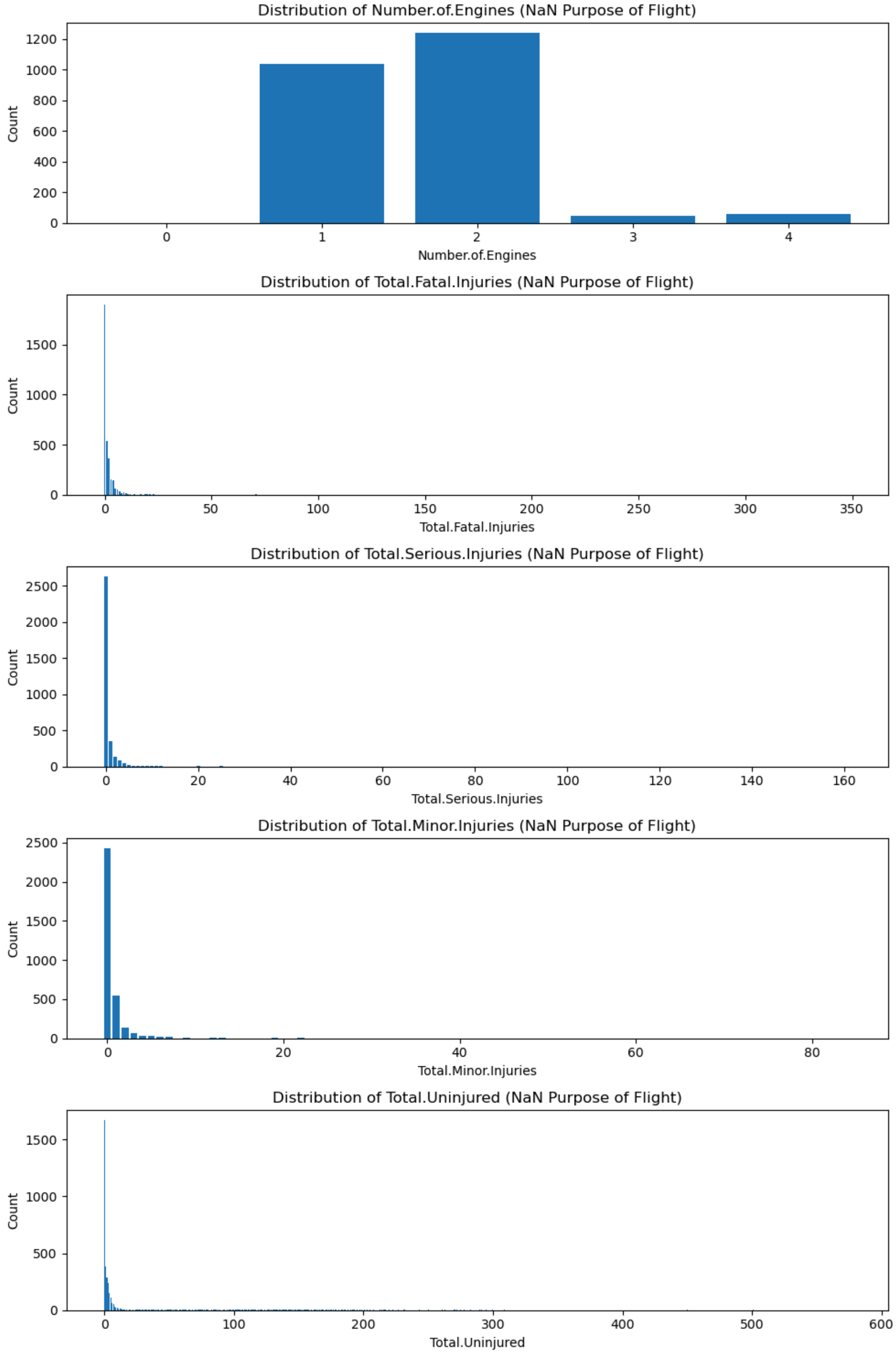
Out[116]:
```
Purpose.of.flight
False    80580
True      4260
Name: count, dtype: int64
```

In [117]:
```
purp_of_flight_df = df[df['Purpose.of.flight'].isna()]

columns_to_analyze = [
    'Number.of.Engines',
    'Total.Fatal.Injuries',
    'Total.Serious.Injuries',
    'Total.Minor.Injuries',
    'Total.Uninjured'
]

counts = {}
for col in columns_to_analyze:
    counts[col] = purp_of_flight_df[col].value_counts()

for col, count in counts.items():
    print(f"Counts for {col}:")
    print(count)
    print("\n")
```

```
Counts for Number.of.Engines:
Number.of.Engines
2.0    1242
1.0    1040
4.0      61
3.0      47
0.0       1
Name: count, dtype: int64


Counts for Total.Fatal.Injuries:
Total.Fatal.Injuries
0.0      1901
1.0       536
2.0       359
3.0       152
4.0       141
         ...
124.0       1
```

In [118]:

```
purp_of_flight_df = df[df['Purpose.of.flight'].isna()]

columns_to_analyze = [
    'Number.of.Engines',
    'Total.Fatal.Injuries',
    'Total.Serious.Injuries',
    'Total.Minor.Injuries',
    'Total.Uninjured'
]

fig, axes = plt.subplots(nrows=len(columns_to_analyze), ncols=1, figs

for ax, col in zip(axes, columns_to_analyze):
    value_counts = purp_of_flight_df[col].value_counts()
    ax.bar(value_counts.index, value_counts.values)
    ax.set_title(f'Distribution of {col} (NaN Purpose of Flight)')
    ax.set_xlabel(col)
    ax.set_ylabel('Count')

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


Distribution of Number.of.Engines (NaN Purpose of Flight)

Distribution of Total.Fatal.Injuries (NaN Purpose of Flight)

Distribution of Total.Serious.Injuries (NaN Purpose of Flight)

Distribution of Total.Minor.Injuries (NaN Purpose of Flight)

Distribution of Total.Uninjured (NaN Purpose of Flight)

In [119]:

```
weat_counts = df['Weather.Condition'].value_counts()
weat_counts
```

Out[119]:

```
Weather.Condition
VMC    75105
IMC     5720
UNK      754
Unk      211
Name: count, dtype: int64
```

In [120]:

```
phase_of_flight_vc = df['Broad.phase.of.flight'].value_counts()
phase_of_flight_vc
```

Out[120]:

```
Broad.phase.of.flight
Landing        15069
Takeoff        12121
Cruise          9899
Maneuvering     8101
Approach        6330
Climb           1848
Taxi            1783
Descent         1777
Go-around       1338
Standing         854
Unknown          536
Other            111
Name: count, dtype: int64
```

In [121]:

```
phase_of_flight_unq = df['Broad.phase.of.flight'].nunique()
phase_of_flight_unq
```

Out[121]:

```
12
```

In [122]:

```
phase_of_flight_nan = df['Broad.phase.of.flight'].isna().value_counts
phase_of_flight_nan
```

Out[122]:

```
Broad.phase.of.flight
False    59767
True     25073
Name: count, dtype: int64
```

In [125]:

```
df.to_csv('cleaned_aviation_data.csv', index=False)
```

In [126]:

```
import os
os.getcwd()
```

Out[126]:

```
'/Users/davidjimenez/NTSB_Aviation_Accident_Database'
```

In [ ]: