Notebook

November 25, 2023

1 Team 2

[44]:
```
# Import necessary libraries

import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from datetime import date, datetime,timedelta
import calendar

# Read the CSV file into a DataFrame
df = pd.read_csv('Airplane_Crashes_and_Fatalities_Since_1908.csv')
# Display the shape (number of rows and columns) of the DataFrame
df.shape
```

[44]:
```
(5268, 13)
```

[43]:
```
df.head(3)
```

[43]:

DateTime	Unnamed: 0	Year	Month	Day	City	Country	Operator	Type	Company	Route	Aboard
1908-09-17 17:18:00	0	1908	9	Thursday	Fort Myer	Virginia	MILITARY - U.S. ARMY	Wright Flyer III	Wright	Demonstration	2.0
1912-07-12 06:30:00	1	1912	7	Friday	AtlantiCity	New Jersey	MILITARY - U.S. NAVY	Dirigible	Dirigible	Test flight	5.0
1913-08-06 00:00:00	2	1913	8	Wednesday	Victoria	British Columbia	PRIVATE	Curtiss seaplane	Curtiss	NaN	1.0

```
                     Fatalities  Ground  Survivors Flight Type    Phase  \
DateTime
1908-09-17 17:18:00         1.0     0.0        1.0    military  unknown
1912-07-12 06:30:00         5.0     0.0        0.0    military  unknown
1913-08-06 00:00:00         1.0     0.0        0.0     private  unknown

                                 Cause  \
DateTime
1908-09-17 17:18:00            unknown
1912-07-12 06:30:00            unknown
1913-08-06 00:00:00  Weather conditions

                                                                Summary
DateTime
1908-09-17 17:18:00  during a demonstration flight, a u.s. army fly…
1912-07-12 06:30:00  first u.s. dirigible akron exploded just offsh…
1913-08-06 00:00:00  the first fatal airplane accident in canada oc…
```

[45]:
```
df.columns
```

[45]:
```
Index(['Date', 'Time', 'Location', 'Operator', 'Flight #', 'Route', 'Type',
       'Registration', 'cn/In', 'Aboard', 'Fatalities', 'Ground', 'Summary'],
      dtype='object')
```

2 Aircraft Crash Information:

- **Date:** date the crash
- **Time:** time the crash
- **Location:** City, Country
- **Operator:** Airline Name (Royal air maroc,rayanair,…..)
- **Flight #:** Flight Number
- **Route:** Departure - Destination
- **Type:** Aircraft Type (Boeing 737,Airbus A320,….)
- **Registration:** Aircraft Registration (An aircraft registration is a code unique to a single aircraft)
- **cn/In:** Construction/Serial Number(is a unique identifier assigned to each individual aircraft during its manufacturing process)
- **Aboard:** Number of People Aboard
- **Fatalities:** Number of Fatalities
- **Ground:** individuals who are not on board the aircraft but are located in the vicinity of the crash site
- **Summary:** Brief Summary of the Case

[46]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 5268 entries, 0 to 5267
```

```
Data columns (total 13 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Date          5268 non-null   object
 1   Time          3049 non-null   object
 2   Location      5248 non-null   object
 3   Operator      5250 non-null   object
 4   Flight #      1069 non-null   object
 5   Route         3562 non-null   object
 6   Type          5241 non-null   object
 7   Registration  4933 non-null   object
 8   cn/In         4040 non-null   object
 9   Aboard        5246 non-null   float64
 10  Fatalities    5256 non-null   float64
 11  Ground        5246 non-null   float64
 12  Summary       4878 non-null   object
dtypes: float64(3), object(10)
memory usage: 535.2+ KB
```

[47]:
```
df.isnull().sum()
```

[47]:
```
Date              0
Time           2219
Location         20
Operator         18
Flight #       4199
Route          1706
Type             27
Registration    335
cn/In          1228
Aboard           22
Fatalities       12
Ground           22
Summary         390
dtype: int64
```

3 Combine 'Date' and 'Time' columns in DateTime

[48]:
```
df['Time'] = df['Time'].replace(np.nan, '00:00')
df['Time'] = df['Time'].str.replace('c: ', '')
df['Time'] = df['Time'].str.replace('c:', '')
df['Time'] = df['Time'].str.replace('c', '')
df['Time'] = df['Time'].str.replace('12\'20', '12:20')
df['Time'] = df['Time'].str.replace('18.40', '18:40')
df['Time'] = df['Time'].str.replace('0943', '09:43')
df['Time'] = df['Time'].str.replace('22\'08', '22:08')
df['Time'] = df['Time'].str.replace('114:20', '00:00')
```

```
# Combine 'Date' and 'Time' columns in DateTime

df['DateTime'] = df['Date'] + ' ' + df['Time']

# Convert 'DateTime' to datetime type

def to_date(x):
    return datetime.strptime(x, '%m/%d/%Y %H:%M')

df['DateTime'] = df['DateTime'].apply(to_date)

# Convert 'Operator' column to uppercase duplicate values

#remove Date and Time
df = df.drop('Date',axis=1)
df = df.drop('Time',axis=1)
```

```
<ipython-input-48-59b58858e084>:6: FutureWarning:

The default value of regex will change from True to False in a future version.
```

[49]:
```
df.sample(2).T
```

[49]:
```
                                                      1943  \
Location              Off Argentia, Newfoundland, Canada
Operator                                Military - U.S. Navy
Flight #                                                NaN
Route                                                   NaN
Type                                           Lockheed P-3A
Registration                                          151362
cn/In                                               185-5075
Aboard                                                 10.0
Fatalities                                             10.0
Ground                                                  0.0
Summary       Crashed into the ocean while on maneuvers.
DateTime                                  1964-11-17 00:00:00

                                                        768
Location                 Between Chungking and Shanghai, China
Operator                   China National Aviation Corporation
Flight #                                                   NaN
Route                                          Chunking - Shanghai
Type                                                       NaN
Registration                                               139
cn/In                                                      NaN
```

```
Aboard                                                    NaN
Fatalities                                                NaN
Ground                                                    NaN
Summary       Disappeared while en route. Plane never located.
DateTime                                    1946-03-18 00:00:00
```

[50]:
```
df = df.drop(['Registration', 'Flight #', 'cn/In'], axis=1)
```

[51]:
```
df['Year'] = df['DateTime'].dt.year
df['Month'] = df['DateTime'].dt.month
def number_to_month(num):
    return calendar.month_name[num]
df['Day'] = df['DateTime'].dt.day_name()
```

[10]:
```
df['Location'].nunique()
```

[10]:
```
4303
```

[52]:
```
df['Location'].value_counts()
```

[52]:
```
Sao Paulo, Brazil                    15
Moscow, Russia                       15
Rio de Janeiro, Brazil               14
Anchorage, Alaska                    13
Manila, Philippines                  13
                                     ..
Near Charana, Bolivia                 1
Monte Matto, Italy                    1
Misaki Mountain, Japan                1
Angelholm, Sweden                     1
State of Arunachal Pradesh, India     1
Name: Location, Length: 4303, dtype: int64
```

[53]:
```
split_location = df['Location'].str.split(',', expand=True)
df['City'] = split_location[0]
df['Country'] = split_location[1]
df = df.drop('Location',axis=1)
```

[54]:
```
df.sample(2).T
```

[54]:
```
                                                      1802  \
Operator                                 Aerolineas Abaroa
Route                              Caranavi - Rurrenabaque
Type                                       Douglas C-47A
Aboard                                               4.0
Fatalities                                           4.0
Ground                                               0.0
```

```
Summary     The failure of the left engine and execution o…
DateTime                                  1962-09-10 00:00:00
Year                                                     1962
Month                                                       9
Day                                                    Monday
City                                             Near Alcoche
Country                                               Bolivia

                                                         2134
Operator                                          Air Canada
Route                               Training -Montreal - Ottawa
Type                                          Douglas DC-8-54F
Aboard                                                   3.0
Fatalities                                               3.0
Ground                                                   0.0
Summary     The plane rolled to the right and crashed inve…
DateTime                                  1967-05-19 18:37:00
Year                                                     1967
Month                                                       5
Day                                                   Friday
City                                                  Ottawa
Country                                              Ontario
```

[55]:
```
df['Type'].sample(10)
```

[55]:
```
1173                          Douglas DC-3
1746                Douglas C-54 Skymaster
2080                           Cessna 205A
3642       Britten-Norman BN-2A Trislander
442                   Stinson SR-7 Reliant
4156                            Bell 206B3
4504                            Learjet 31
2499                  Vickers Vanguard 951
3380       de Havilland Canada DHC-3 Otter
4238    Britten-Norman BN-2A-21 Trislander
Name: Type, dtype: object
```

[56]:
```
df['Type'] = df['Type'].fillna('')

def extract_word(row):
    words = row.split()
    if words and len(words[0]) < 3:
        return max(words, key=len)
    elif words:
        return words[0]
    else:
        return ''
```

```
df['Company'] = df['Type'].apply(extract_word)
```

[57]:
```
df['Company'].sample(10)
```

[57]:
```
4820      Antonov
2594     Ilyushin
4189      Antonov
1686      Vickers
1815         Saab
65        Breguet
4082    Havilland
4579    DC-3-65TP
1574      Bristol
3198       Boeing
Name: Company, dtype: object
```

[58]:
```
df['Operator'].value_counts()
```

[58]:
```
Aeroflot                                179
Military - U.S. Air Force               176
Air France                               70
Deutsche Lufthansa                       65
Air Taxi                                 44
                                       ...
Military - Argentine Navy                 1
Richland Flying Service - Air Taxii       1
Harbor Airlines - Air Taxi                1
Aerovias Venezolanas SA (Venezuela)       1
Strait Air                                1
Name: Operator, Length: 2476, dtype: int64
```

[59]:
```
df['Operator'].nunique()
```

[59]:
```
2476
```

[60]:
```
df['Operator'] = df['Operator'].str.upper()
df['Operator'].fillna('', inplace=True)

ope_conditions = [
    df['Operator'].str.contains('MAIL|EXPRESS|TRANSPORT|SERVICE', case=False,␣
 ↪regex=True),
    df['Operator'].str.contains('PRIVATE', case=False),
    df['Operator'].str.contains('AIR FORCE|MILITARY', case=False, regex=True)
]

flight_type_values = ['cargo', 'private', 'military']
```

```
df['Flight Type'] = np.select(ope_conditions, flight_type_values,␣
 ↪default='passenger')
```

[61]:
```
df.sample(3).T
```

[61]:

	2643	\
Operator	AIR AMERICA	
Route	NaN	
Type	Fairchild C-123	
Aboard	4.0	
Fatalities	4.0	
Ground	0.0	
Summary	NaN	
DateTime	1973-03-07 00:00:00	
Year	1973	
Month	3	
Day	Wednesday	
City	Near Ban Hong Sa	
Country	Laos	
Company	Fairchild	
Flight Type	passenger	

	1994	\
Operator	UNITED AIR LINES	
Route	New York City - Chicago	
Type	Boeing B-727-22	
Aboard	30.0	
Fatalities	30.0	
Ground	0.0	
Summary	The plane crashed into Lake Michigan 19.5 mile…	
DateTime	1965-08-16 20:21:00	
Year	1965	
Month	8	
Day	Monday	
City	Lake Michigan	
Country	near Chicago	
Company	Boeing	
Flight Type	passenger	

	1528
Operator	INDIAN AIRLINES
Route	Simra - Kathmandu
Type	Douglas DC-3
Aboard	20.0
Fatalities	20.0
Ground	0.0

```
Summary      Due to a navigational error the aircraft flew …
DateTime                                  1958-03-24 00:00:00
Year                                                     1958
Month                                                       3
Day                                                    Monday
City                                           Near Kathmandu
Country                                                Nepal
Company                                               Douglas
Flight Type                                         passenger
```

[62]:
```
df['Survivors'] = df['Aboard'] - df['Fatalities']
```

[63]:
```
df['Summary'] = df['Summary'].str.lower()

df['Summary'].fillna('', inplace=True)

def get_phase(summary):
    if 'landing' in summary.lower() or 'land' in summary.lower() or␣
 ↪'descending' in summary.lower():
        return 'While landing'
    elif 'en route' in summary.lower() or 'route' in summary.lower():
        return 'While en route'
    elif 'taking off' in summary.lower() or 'takeoff' in summary.lower():
        return 'While taking off'
    else:
        return 'unknown'

def get_cause(summary):
    if 'shot down by' in summary.lower():
        return 'War'
    elif any(keyword in summary.lower() for keyword in ['weather','icing ',␣
 ↪'fog', 'storm', 'lightning']):
        return 'Weather conditions'
    elif any(keyword in summary.lower() for keyword in ['pilot', 'pilot␣
 ↪error']):
        return 'Pilot error'
    elif any(keyword in summary.lower() for keyword in ['engine', 'engine␣
 ↪failure']):
        return 'Engine failure'
    elif any(keyword in summary.lower() for keyword in ['fire']):
        return 'Fire'
    elif any(keyword in summary.lower() for keyword in ['collided']):
        return 'Clash'
    else:
        return 'unknown'

df['Phase'] = df['Summary'].apply(get_phase)
```

```
df['Cause'] = df['Summary'].apply(get_cause)
```

[64]:
```
new_column_order = ['DateTime','Year','Month','Day','City', 'Country',␣
 ↪'Operator', 'Type', 'Company',
                    'Route', 'Aboard', 'Fatalities', 'Ground','Survivors',␣
 ↪'Flight Type', 'Phase','Cause','Summary']
df = df[new_column_order]
```

[65]:
```
df.sample(5).T
```

[65]:

	3759	\
DateTime	1988-04-16 00:00:00	
Year	1988	
Month	4	
Day	Saturday	
City	St. Just	
Country	France	
Operator	CHAILLOTINE AIR SERVICE	
Type	Mitsubishi MU-2L Marquise	
Company	Mitsubishi	
Route	NaN	
Aboard	6.0	
Fatalities	6.0	
Ground	0.0	
Survivors	0.0	
Flight Type	cargo	
Phase	unknown	
Cause	unknown	
Summary		

	3912	\
DateTime	1990-01-02 13:40:00	
Year	1990	
Month	1	
Day	Tuesday	
City	Java Sea	
Country	Indonesia	
Operator	PELITA AIR SERVICE	
Type	CASA 212 Aviocar 200	
Company	CASA	
Route	Palambang and Jakarta	
Aboard	16.0	
Fatalities	9.0	
Ground	0.0	
Survivors	7.0	
Flight Type	cargo	
Phase	unknown	

```
Cause                                              Engine failure
Summary      ditched into the java sea after experiencing m…

                                                             1450  \
DateTime                                        1956-11-17 17:00:00
Year                                                         1956
Month                                                          11
Day                                                      Saturday
City                                              El Rucio Mountain
Country                                                  Colombia
Operator                              EMPRESA AVIACION DEL PACIFICO
Type                                                 Douglas DC-3
Company                                                  Douglas
Route                                          Buenaventura - Cali
Aboard                                                       36.0
Fatalities                                                   36.0
Ground                                                        0.0
Survivors                                                     0.0
Flight Type                                              passenger
Phase                                                While en route
Cause                                                       unknown
Summary      hit el rucio mountain at 6,200 ft. which was o…

                                 65    \
DateTime            1922-07-26 00:00:00
Year                                1922
Month                                  7
Day                            Wednesday
City                               Cadix
Country                            Spain
Operator     GRANDS EXPRESS AERIENS
Type                         Breguet 14
Company                         Breguet
Route                               NaN
Aboard                              3.0
Fatalities                          3.0
Ground                              0.0
Survivors                           0.0
Flight Type                       cargo
Phase                           unknown
Cause                           unknown
Summary

                                                             1113
DateTime                                        1951-03-02 09:12:00
Year                                                         1951
Month                                                           3
```

```
Day                                                      Friday
City                                                  Sioux City
Country                                                     Iowa
Operator                                   MID CONTINENT AIRLINES
Type                                                 Douglas DC-3
Company                                                  Douglas
Route           Kansas City, MO - Omaha, NB - Sioux City, Iowa
Aboard                                                      25.0
Fatalities                                                  16.0
Ground                                                       0.0
Survivors                                                    9.0
Flight Type                                            passenger
Phase                                                    unknown
Cause                                          Weather conditions
Summary      after a missed ils approach , the pilot stalle…
```

[66]:
```
df.to_csv('Airplane_Crashes_LV2.csv')
```

[67]:
```
df.columns
```

[67]:
```
Index(['DateTime', 'Year', 'Month', 'Day', 'City', 'Country', 'Operator',
       'Type', 'Company', 'Route', 'Aboard', 'Fatalities', 'Ground',
       'Survivors', 'Flight Type', 'Phase', 'Cause', 'Summary'],
      dtype='object')
```

4 Aircraft Crash New Information:

- **DateTime:** date the crash
- **Year:** Year the crash
- **Month:** Month the crash
- **Day:** Day the crash
- **City:**
- **Company:**
- **Operator:** Airline Name (Royal air maroc,rayanair,…..)
- **Type:** Aircraft Type (Boeing 737,Airbus A320,….)
- **Route:** Departure - Destination
- **Aboard:** Number of People Aboard
- **Fatalities:** Number of Fatalities
- **Ground:** individuals who are not on board the aircraft but are located in the vicinity of the crash site
- **Survivors:**
- **Flight Type:**
- **Phase:** The phase of the accident (landing,en route,taking off)
- **Cause:** The cause of the accident (weather condition .. . . . .)
- **Summary:** Brief Summary of the Case

[68]:
```
df = pd.read_csv('Airplane_Crashes_LV2.csv')
```

Data Visualization Part:

Objectives:

By analyzing and visualizing our dataset, we aim to reveal answers for the following questions:

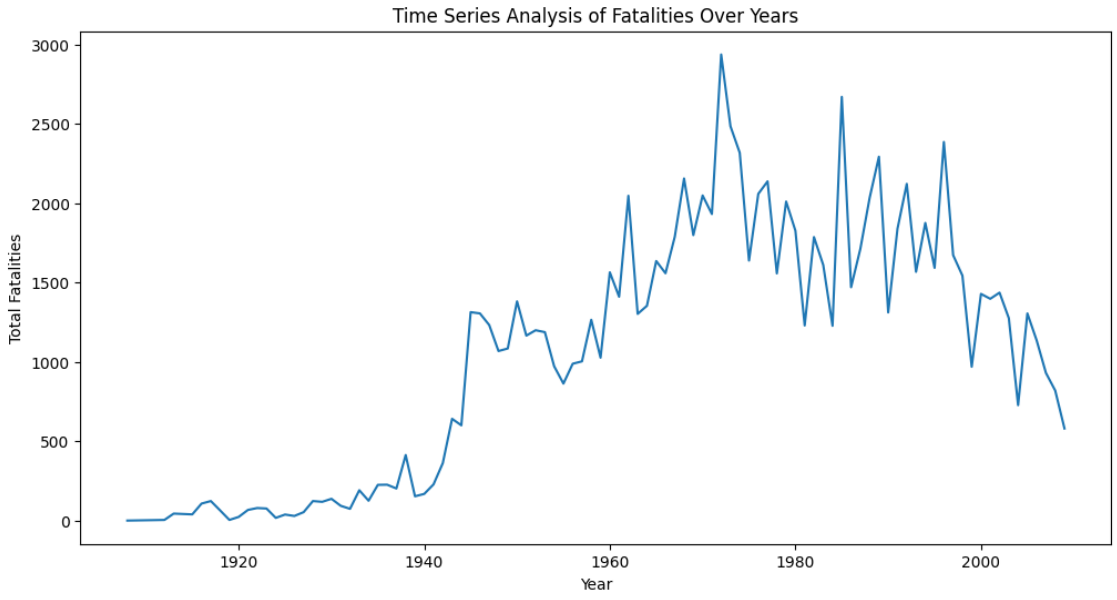
1. Is the number of aircrashes reduced over years? (Y/N).
2. What types of airplanes are the most known with aircrashes issues?
3. What are the operators that are the most known with aircrashes issues?
4. In which phase the aircrashes may frequently happens?
5. To what an aircrash is due?
6. What countries are the most known with aircrashes issues?

[69]:
```
#We started by importing the needed libraries.
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
```

[70]:
```
#We Import our dataset(Cleaned already)
df = pd.read_csv('Airplane_Crashes_LV2.csv')
```

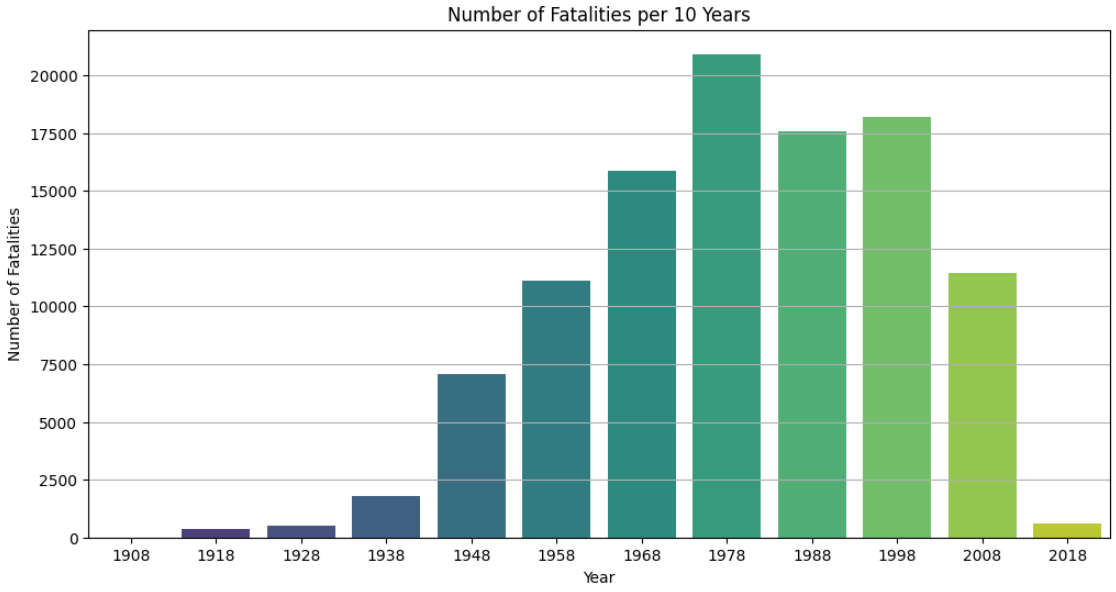
1. Is the number of aircrashes reduced over years? (Y/N).

[71]:
```
# Time Series Analysis of Fatalities Over Years
plt.figure(figsize=(12, 6))
df.groupby('Year')['Fatalities'].sum().plot(kind='line')
plt.title('Time Series Analysis of Fatalities Over Years')
plt.xlabel('Year')
plt.ylabel('Total Fatalities')
plt.show()
```



[72]:
```
df['DateTime'] = pd.to_datetime(df['DateTime'])
df.set_index('DateTime', inplace=True)

plt.figure(figsize=(12, 6))

# Resample the data by 10 years and sum the fatalities
yearly_fatalities = df.resample('10Y').sum()['Fatalities']

# Convert the index to string for better readability in the plot
yearly_fatalities.index = yearly_fatalities.index.year.astype(str)

# Plot using Seaborn for a more visually appealing plot
sns.barplot(x=yearly_fatalities.index, y=yearly_fatalities, palette="viridis")

# Customize the plot
plt.title('Number of Fatalities per 10 Years')
plt.xlabel('Year')
plt.ylabel('Number of Fatalities')
plt.grid(axis='y')  # Add horizontal grid lines for better readability
plt.show()
```

```
<ipython-input-72-f82ada4612f5>:7: FutureWarning:

The default value of numeric_only in DataFrameGroupBy.sum is deprecated. In a
future version, numeric_only will default to False. Either specify numeric_only
or select only columns which should be valid for the function.
```

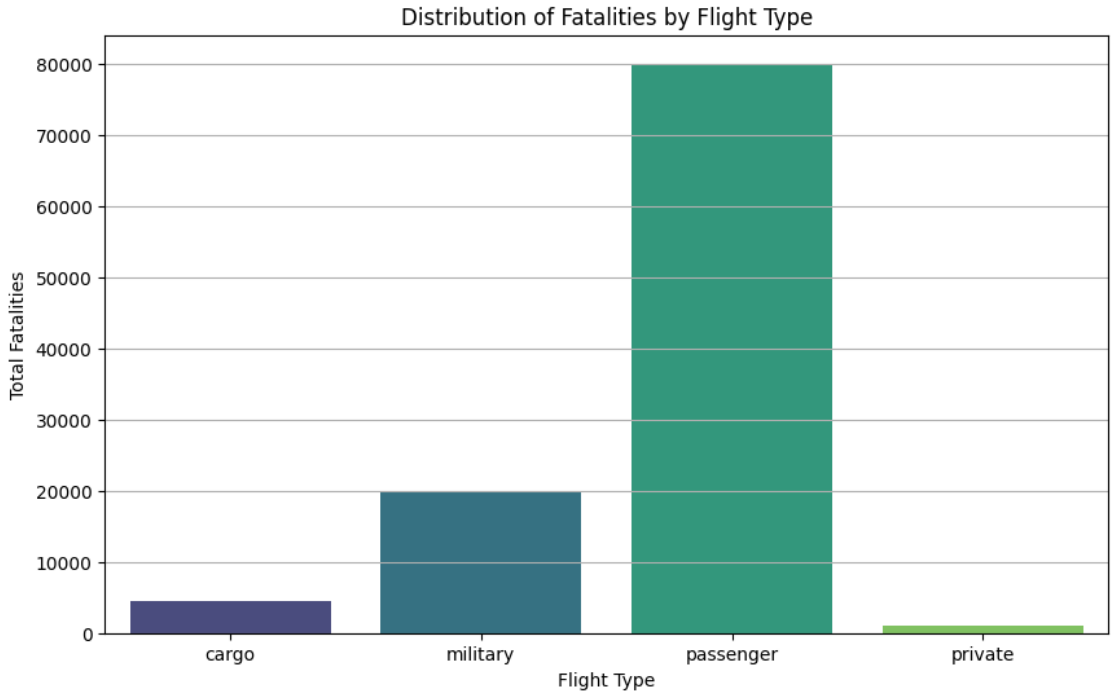


Interpretation:

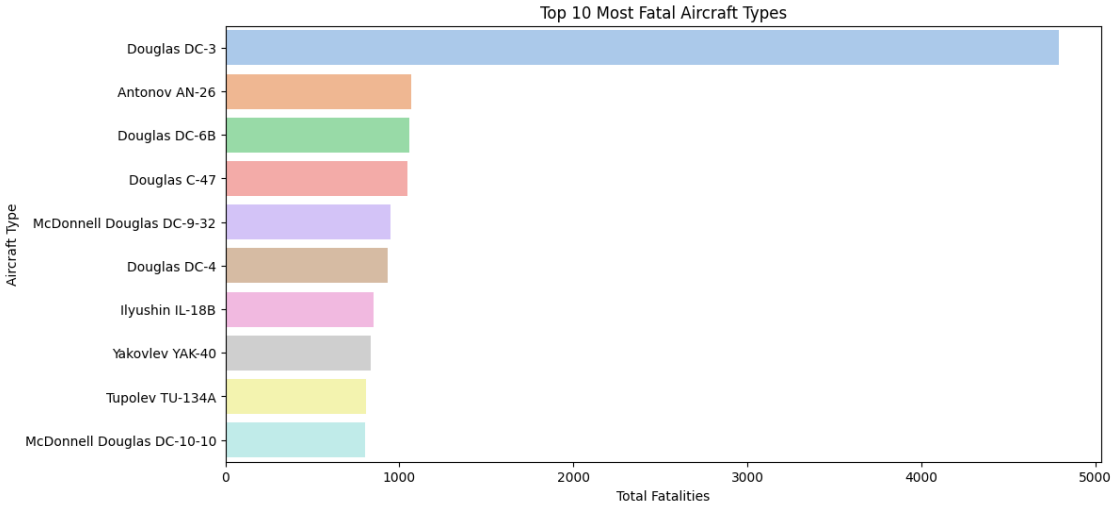
We can observ clearly a positive evolution in fatalities from 1908 to 1978, this may be attributed to the early stages of aviation development, characterized by increased risks and less advanced safety measures. After that comes a significant decrease from 1979 to 2018. and that may be due to advancements in aviation safety practices, technologies, and regulations, leading to a substantial improvement in overall safety outcomes over the latter part of the century.

2- What types of airplanes are the most known with aircrashes issues?

[73]:
```
plt.figure(figsize=(10, 6))

# Aggregate data by summing up 'Fatalities' for each 'Flight Type'
flight_type_fatalities = df.groupby('Flight Type')['Fatalities'].sum().
 ↪reset_index()

# Plotting the distribution of fatalities by flight type using Seaborn
sns.barplot(data=flight_type_fatalities, x='Flight Type', y='Fatalities',␣
 ↪palette='viridis')

# Customize the plot
plt.title('Distribution of Fatalities by Flight Type')
plt.xlabel('Flight Type')
plt.ylabel('Total Fatalities')
plt.grid(axis='y')  # Add horizontal grid lines for better readability
plt.show()
```



[74]:
```
# The 10 Most Fatal Aircraft Types
plt.figure(figsize=(12, 6))
top_fatal_aircraft_types = df.groupby('Type')['Fatalities'].sum().nlargest(10)
sns.barplot(x=top_fatal_aircraft_types.values, y=top_fatal_aircraft_types.
 ↪index, palette='pastel')
plt.title('Top 10 Most Fatal Aircraft Types')
plt.xlabel('Total Fatalities')
plt.ylabel('Aircraft Type')
plt.show()
```

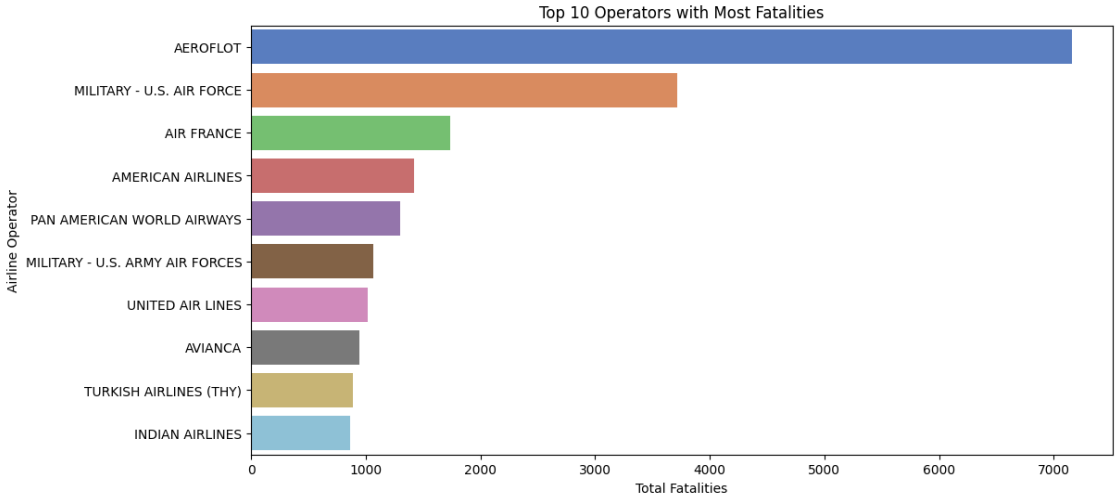


Interpretation:

> The presence of *military flights* among the highest fatalities in the distribution by flight type suggests **potential risks associated with military aviation operations**. Simultaneously, the identification of the *Douglas C3* as the **top aircraft type with fatalities** in the top 10 most fatal aircraft types indicates **historical vulnerabilities** associated with this specific model, highlighting the importance of scrutinizing its safety records and potential contributing factors to better inform aviation safety measures.

3- What are the operators that are the most known with aircrashes issues?

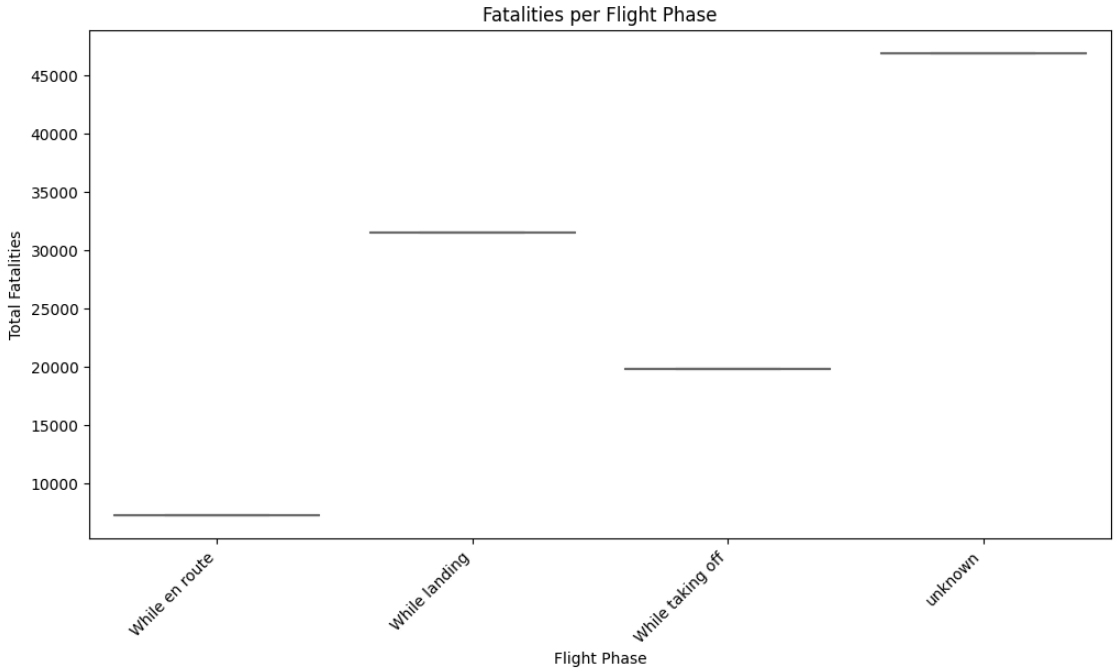
[75]:
```
# Top 10 Operators with Most Fatalities
top_operators_fatalities = df.groupby('Operator')['Fatalities'].sum().
 ↪nlargest(10)

plt.figure(figsize=(12, 6))
sns.barplot(x=top_operators_fatalities.values, y=top_operators_fatalities.
 ↪index, palette='muted')
plt.title('Top 10 Operators with Most Fatalities')
plt.xlabel('Total Fatalities')
plt.ylabel('Airline Operator')
plt.show()
```



Interpretation: > The huge contrast in aircrash numbers, with **Aeroflot leading with around 7000** incidents, followed by the **U.S. military** with roughly half that amount, and **Air France** with half the total of the U.S, underscores the unique safety challenges faced by each operator, necessitating tailored safety strategies reflective of their individual operational contexts.

4. In which phase the aircrashes may frequently happens?

[76]:
```
plt.figure(figsize=(12, 6))

# Aggregate data by summing up 'Fatalities' for each 'Phase'
phase_fatalities = df.groupby('Phase')['Fatalities'].sum().reset_index()

# Box Plot of Fatalities by Flight Phase using Seaborn
sns.boxplot(data=phase_fatalities, x='Phase', y='Fatalities', palette='Set3')

# Customize the plot
plt.title('Fatalities per Flight Phase')
plt.xlabel('Flight Phase')
plt.ylabel('Total Fatalities')
plt.xticks(rotation=45, ha='right')

# Explicitly show the plot
plt.show()
```

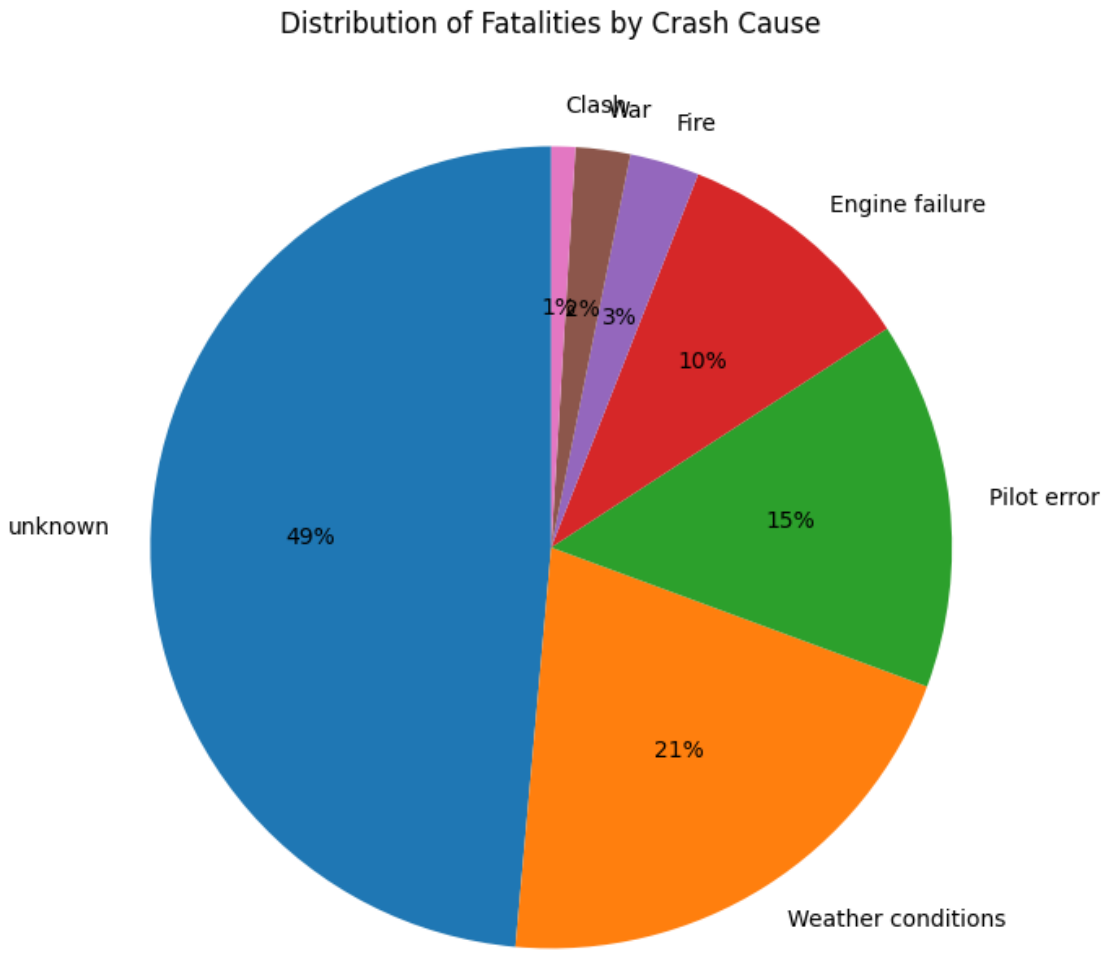


Interpretation:

The presence of larger boxplots for aircrashes during **landing and takeoff** phases suggests that these **critical stages of flight operations** pose a higher risk, emphasizing the importance of targeted safety measures during these phases to mitigate the frequency of incidents.

5. To what an aircrash is due?

[77]:
```
# Distribution of Fatalities by Crash Cause
plt.figure(figsize=(16, 8))
df['Cause'].value_counts().plot(kind='pie', autopct='%1.0f%%', startangle=90)
plt.title('Distribution of Fatalities by Crash Cause')
plt.ylabel('')
plt.show()
```



Interpretation:

The dominance of **unknown crash** causes, coupled with notable contributions from weather conditions, pilot-related factors, and engine failure, underscores the critical **need for enhanced incident investigation** and **data transparency** to advance our understanding of aircrash causality and inform targeted safety improvements.

6. What countries are the most known with aircrashes issues?

[78]:
```
# Map of Fatalities by Country
fig = px.choropleth(df.groupby('Country')['Fatalities'].sum().reset_index(),
                    locations='Country',
                    locationmode='country names',
                    color='Fatalities',
                    hover_name='Country',
                    color_continuous_scale='reds',
                    title='Fatalities by Country')
fig.show()
```

[78]:

Interpretation:

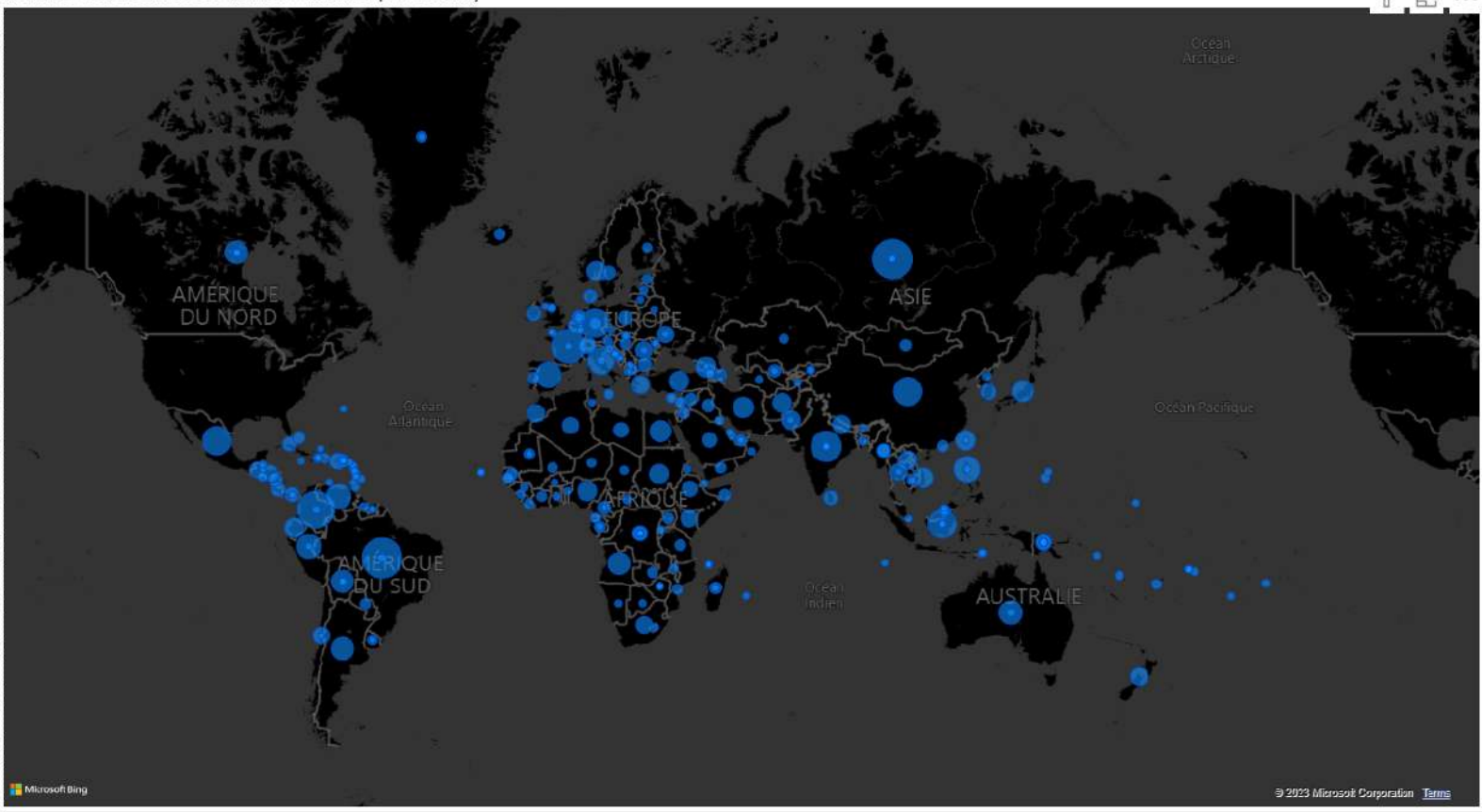
The concentration of fatalities in most of **Latin American countries** on the map suggests a **potential regional pattern**, prompting further investigation into regional aviation safety practices, infrastructure, and operational factors to discern underlying causes and facilitate targeted safety enhancements in these areas.

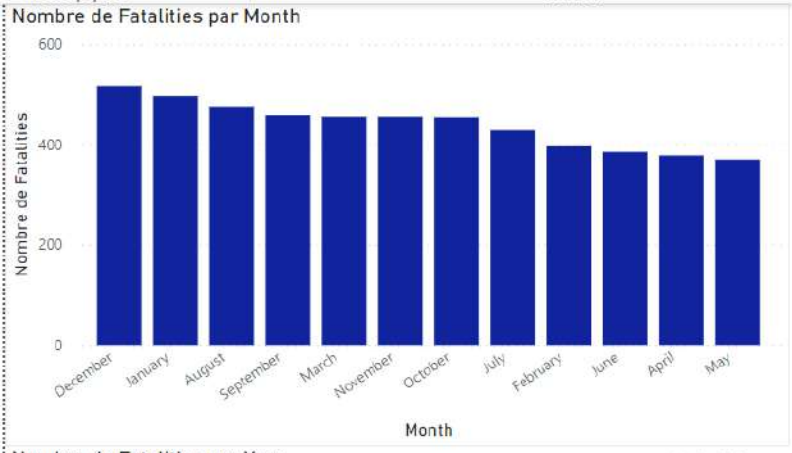
#Conclusion:

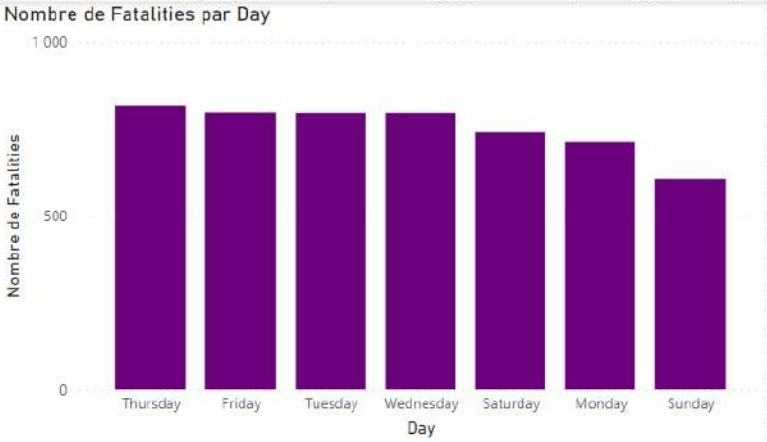
> Based on the analysis, aircrashes vary across military, passenger, and private flight types, emphasizing the need for tailored safety training programs. Model-specific safety reviews, particularly for aircraft like the Douglas C3 with higher fatality rates, should be conducted to address historical vulnerabilities. Distinct aircrash patterns among operators like Aeroflot and the U.S. Air Force highlight the necessity for customized safety interventions.
>
> To enhance aviation safety, actions include tailored training, focused model reviews, and global collaboration to address regional risk patterns and implement best practices.

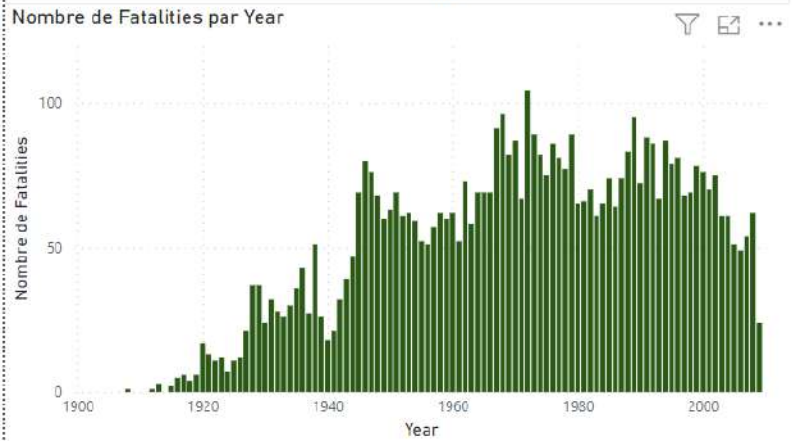
[78]:

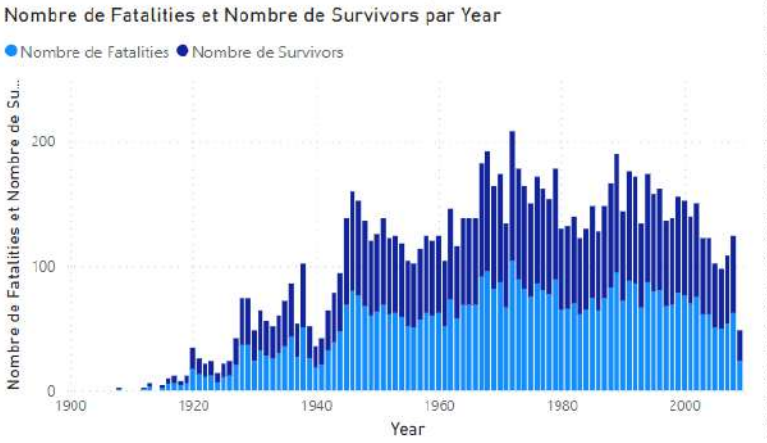
Nombre de Fatalities et Premier Fatalities par Country



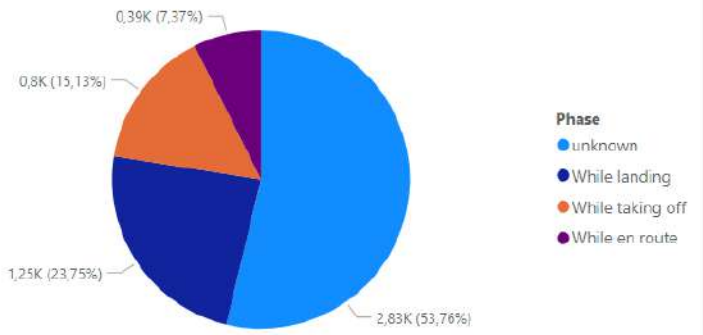

Nombre de Fatalities par Month
600
400
200
0
Nombre de Fatalities
December
January
August
September
March
November
October
July
February
June
April
May
Month


Nombre de Fatalities par Day
1 000
500
0
Nombre de Fatalities
Thursday
Friday
Tuesday
Wednesday
Saturday
Monday
Sunday
Day

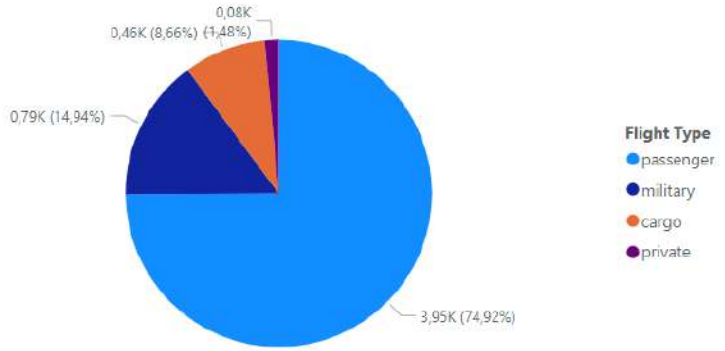

Nombre de Fatalities par Year
100
50
0
Nombre de Fatalities
1900
1920
1940
1960
1980
2000
Year


Nombre de Fatalities et Nombre de Survivors par Year
Nombre de Fatalities
Nombre de Survivors
Nombre de Fatalities et Nombre de Su...
200
100
0
1900
1920
1940
1960
1980
2000
Year

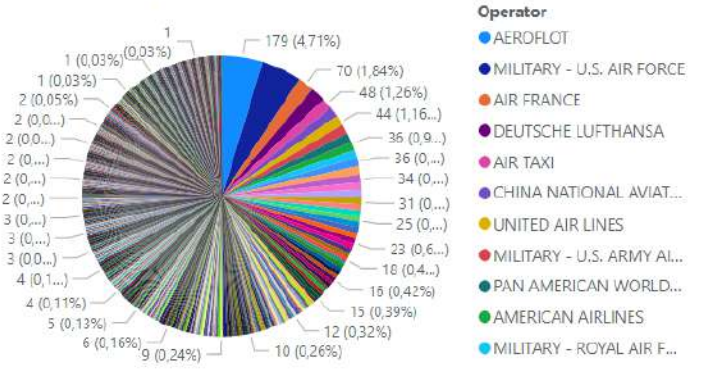
Nombre de Fatalities par Phase



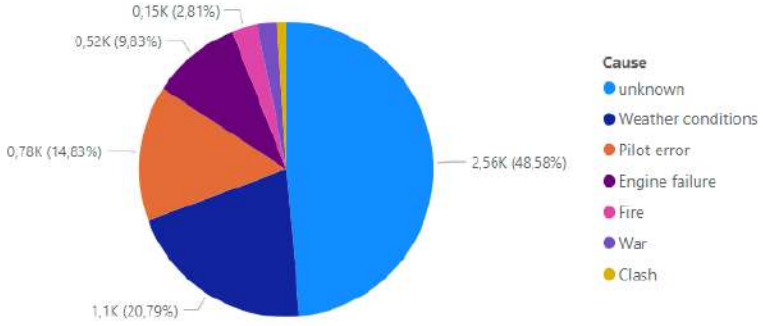
Nombre de Fatalities par Flight Type

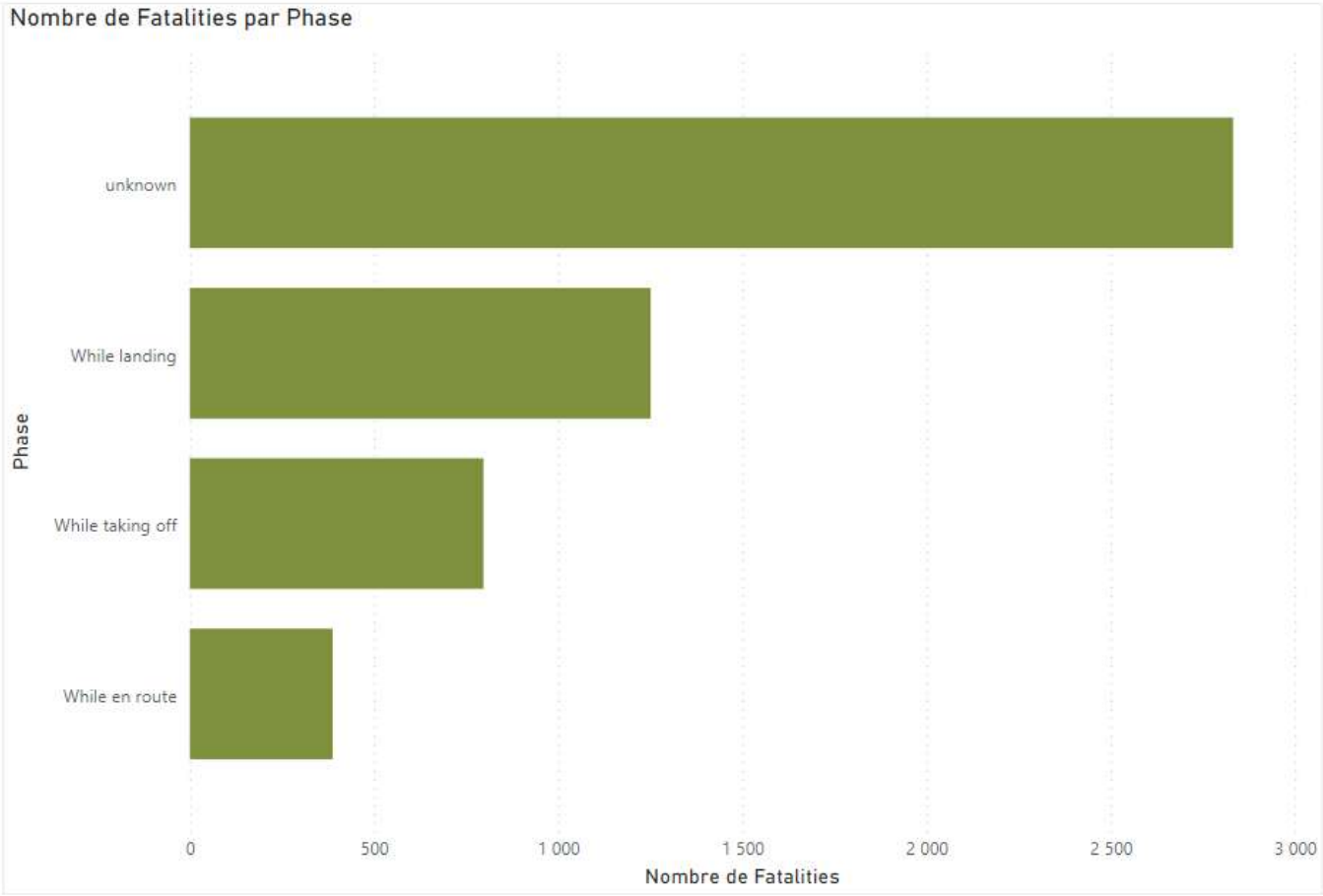


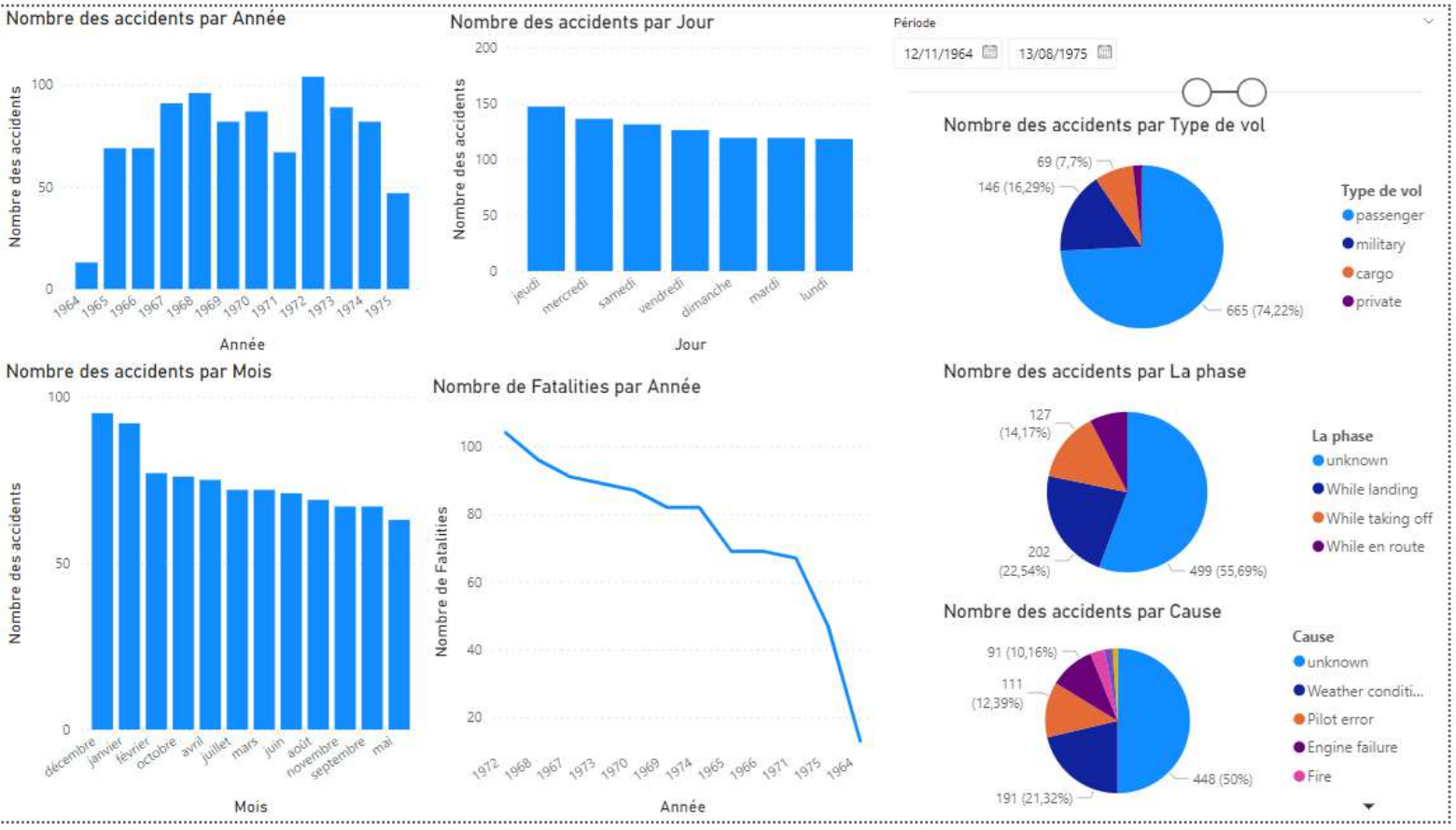
Nombre de Fatalities par Operator



Nombre de Fatalities par Cause




Nombre de Fatalities par Phase
unknown
While landing
While taking off
While en route
Phase
0
500
1 000
1 500
2 000
2 500
3 000
Nombre de Fatalities


Nombre des accidents par Année
Nombre des accidents
100
50
0
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
Année
Nombre des accidents par Jour
Nombre des accidents
200
150
100
50
0
jeudi
mercredi
samedi
vendredi
dimanche
mardi
lundi
Jour
Période
12/11/1964
13/08/1975
Nombre des accidents par Type de vol
69 (7,7%)
146 (16,29%)
665 (74,22%)
Type de vol
passenger
military
cargo
private
Nombre des accidents par Mois
Nombre des accidents
100
50
0
décembre
janvier
février
octobre
avril
juillet
mars
juin
août
novembre
septembre
mai
Mois
Nombre de Fatalities par Année
Nombre de Fatalities
100
80
60
40
20
1972
1968
1967
1973
1970
1969
1974
1965
1966
1971
1975
1964
Année
Nombre des accidents par La phase
127
(14,17%)
202
(22,54%)
499 (55,69%)
La phase
unknown
While landing
While taking off
While en route
Nombre des accidents par Cause
91 (10,16%)
111
(12,39%)
448 (50%)
191 (21,32%)
Cause
unknown
Weather conditi...
Pilot error
Engine failure
Fire