Setting up the data for visualization

In [1]:
```
import numpy as np
import pandas as pd
import datetime
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.express as px
%matplotlib inline
from warnings import filterwarnings
filterwarnings("ignore")
```

In [2]:
```
# Read data from table
# Dataset ("/kaggle/input/nuclear-explosions-data/nuclear_explosions.csv")
nukes = pd.read_csv("nuclear_explosions.csv")
```

In [3]:
```
nukes.columns
```

Out[3]:
```
Index(['WEAPON SOURCE COUNTRY', 'WEAPON DEPLOYMENT LOCATION', 'Data.Source',
       'Location.Cordinates.Latitude', 'Location.Cordinates.Longitude',
       'Data.Magnitude.Body', 'Data.Magnitude.Surface',
       'Location.Cordinates.Depth', 'Data.Yeild.Lower', 'Data.Yeild.Upper',
       'Data.Purpose', 'Data.Name', 'Data.Type', 'Date.Day', 'Date.Month',
       'Date.Year'],
      dtype='object')
```

In [5]:
```
# Renaming columns
nukes.rename(columns = {"WEAPON SOURCE COUNTRY":"Source Country",
                         "WEAPON DEPLOYMENT LOCATION":"Deployment Location",
                        "Location.Cordinates.Latitude": "Latitude",
                        "Location.Cordinates.Longitude":"Longitude",
                        "Location.Cordinates.Depth":"Depth",
                        "Data.Source":"Source",
                        "Data.Magnitude.Body":"Body Wave Magnitude",
                        "Data.Magnitude.Surface":"Surface Wave Magnitude",
                        "Data.Yeild.Lower":"Explosion Yield L",
                        "Data.Yeild.Upper":"Explosion Yield U",
                        "Data.Purpose":"Detonation Reason",
                        "Data.Name":"Name",
                        "Data.Type":"Detonation Method",
                        "Date.Day":"Day",
                        "Date.Month":"Month",
                        "Date.Year":"Year"}, inplace=True)
```

In [6]:
```
nukes.columns
```

Out[6]:
```
Index(['Source Country', 'Deployment Location', 'Source', 'Latitude',
       'Longitude', 'Body Wave Magnitude', 'Surface Wave Magnitude', 'Depth',
       'Explosion Yield L', 'Explosion Yield U', 'Detonation Reason', 'Name',
       'Detonation Method', 'Day', 'Month', 'Year'],
      dtype='object')
```

In [7]:
```
# Checking for null values in dataset
nukes.isna().sum()
```

Out[7]:
```
Source Country          0
Deployment Location     0
Source                  0
Latitude                0
Longitude               0
Body Wave Magnitude     0
Surface Wave Magnitude  0
Depth                   0
Explosion Yield L       0
Explosion Yield U       0
Detonation Reason       0
Name                    0
Detonation Method       0
Day                     0
Month                   0
Year                    0
dtype: int64
```

In [8]:
```
# Remove missing value features having NaN, Na, Null
print("Missing values by features:")
for col in nukes.columns:
    num = 0
    num = num + len(nukes[nukes[col] == "Nan"])
    num = num + len(nukes[nukes[col] == "Na"])
    num = num + len(nukes[nukes[col] == "Null"])
    print(f"{col}: {num} missing values\n")
```

```
Missing values by features:
Source Country: 0 missing values

Deployment Location: 0 missing values

Source: 0 missing values

Latitude: 0 missing values

Longitude: 0 missing values

Body Wave Magnitude: 0 missing values

Surface Wave Magnitude: 0 missing values

Depth: 0 missing values

Explosion Yield L: 0 missing values

Explosion Yield U: 0 missing values

Detonation Reason: 1 missing values

Name: 663 missing values

Detonation Method: 0 missing values

Day: 0 missing values

Month: 0 missing values

Year: 0 missing values
```

In [9]:
```
nukes["Name"] = nukes["Name"].apply(lambda x: "Unnamed" if x == "Nan" or x == "Null" o
```

In [11]:
```
# Check for duplicates
duplicates = nukes[nukes.duplicated()]
print(duplicates)
print("\n\nNumber of Rows Duplicated", duplicates.shape)
```

```
     Source Country Deployment Location Source  Latitude  Longitude  \
352            USSR            Mtr Russ    MTM      48.0       46.0
1599           USSR          Semi Kazakh    MTM      50.0       78.0
1789           USSR           Perm Russ    NOA      61.0       58.0

      Body Wave Magnitude  Surface Wave Magnitude  Depth  Explosion Yield L  \
352                   0.0                     0.0    0.0              1.200
1599                  0.0                     0.0    0.0              0.001
1789                  4.5                     0.0    0.0              3.200

      Explosion Yield U Detonation Reason     Name Detonation Method  Day  \
352                 1.2                We  Unnamed             Space   27
1599               20.0                Wr  Unnamed            Tunnel    5
1789                3.2               Pne    Geliy             Shaft   28

      Month  Year
352      10  1961
1599     12  1980
1789      8  1984


Number of Rows Duplicated (3, 16)
```

In [12]:
```
# remove duplicates
nukes = nukes.drop(nukes.index[[352, 1599, 1789]])
```

In [15]:
```
# Check again for duplicates
new_duplicates = nukes[nukes.duplicated()]
print("\n\nNumber of Duplicates:", new_duplicates.shape)
```

```
Number of Duplicates: (0, 16)
```

In [16]:
```
print("No more duplicates as the row dimension is a 0.")
```

```
No more duplicates as the row dimension is a 0.
```

In [17]:
```
# Unique values in each feature
for col in nukes.columns:
    distincts = len(nukes[col].unique())
    print(f"{col}: {distincts} Distinct Values\n")
```

```
Source Country: 7 Distinct Values

Deployment Location: 79 Distinct Values

Source: 13 Distinct Values

Latitude: 525 Distinct Values

Longitude: 573 Distinct Values

Body Wave Magnitude: 43 Distinct Values

Surface Wave Magnitude: 26 Distinct Values

Depth: 137 Distinct Values

Explosion Yield L: 308 Distinct Values

Explosion Yield U: 310 Distinct Values

Detonation Reason: 28 Distinct Values

Name: 1306 Distinct Values

Detonation Method: 20 Distinct Values

Day: 31 Distinct Values

Month: 12 Distinct Values

Year: 50 Distinct Values
```

Further analysis of the data

In [21]:
```python
# Some rows from the dataset
nukes.head()
```

Out[21]:

	Source Country	Deployment Location	Source	Latitude	Longitude	Body Wave Magnitude	Surface Wave Magnitude	Depth	Explosion Yield L	Ex
0	USA	Alamogordo	DOE	32.54	-105.57	0.0	0.0	-0.10	21.0	
1	USA	Hiroshima	DOE	34.23	132.27	0.0	0.0	-0.60	15.0	
2	USA	Nagasaki	DOE	32.45	129.52	0.0	0.0	-0.60	21.0	
3	USA	Bikini	DOE	11.35	165.20	0.0	0.0	-0.20	21.0	
4	USA	Bikini	DOE	11.35	165.20	0.0	0.0	0.03	21.0	

In [22]:
```python
# Stastistical data
nukes.describe()
```

Out[22]:

	Latitude	Longitude	Body Wave Magnitude	Surface Wave Magnitude	Depth	Explosion Yield L	Explosion Yield U
count	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
mean	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
std	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
min	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
50%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
75%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
max	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50000.000000

In [23]:

```
# Datatype of each feature
print(nukes.dtypes)
```

```
Source Country              object
Deployment Location         object
Source                      object
Latitude                   float64
Longitude                  float64
Body Wave Magnitude        float64
Surface Wave Magnitude     float64
Depth                      float64
Explosion Yield L          float64
Explosion Yield U          float64
Detonation Reason           object
Name                        object
Detonation Method           object
Day                          int64
Month                        int64
Year                         int64
dtype: object
```

In [24]:

```
# In data we have lower bound and upper bound of yield
# Feature engineering : Take average explosion yield
nukes["Explosion Yield Average"] = (nukes["Explosion Yield L"] + nukes["Explosion Yiel
```

In [26]:

```
nukes["Explosion Yield Average"].head()
```

Out[26]:

```
0    21.0
1    15.0
2    21.0
3    21.0
4    21.0
Name: Explosion Yield Average, dtype: float64
```

In [27]:

```
# Check whether new feature would be useeful or not
# Check to get the exact number of instances where the upper yield is not equal to the
wanted_cols = ["Explosion Yield U", "Explosion Yield L", "Explosion Yield Average"]
unwanted_cols = [col for col in nukes.columns if col not in wanted_cols]
yields = nukes.drop(unwanted_cols, axis="columns")
yields.head()
```

Out[27]:

	Explosion Yield L	Explosion Yield U	Explosion Yield Average
0	21.0	21.0	21.0
1	15.0	15.0	15.0
2	21.0	21.0	21.0
3	21.0	21.0	21.0
4	21.0	21.0	21.0

In [28]:

```
yields.tail()
```

Out[28]:

	Explosion Yield L	Explosion Yield U	Explosion Yield Average
2041	3.0	12.0	7.5
2042	0.0	20.0	10.0
2043	0.0	1.0	0.5
2044	0.0	35.0	17.5
2045	0.0	18.0	9.0

In [29]:

```
# Here, the tail columns does not have same upper and lower yield. Hence, new feature
```

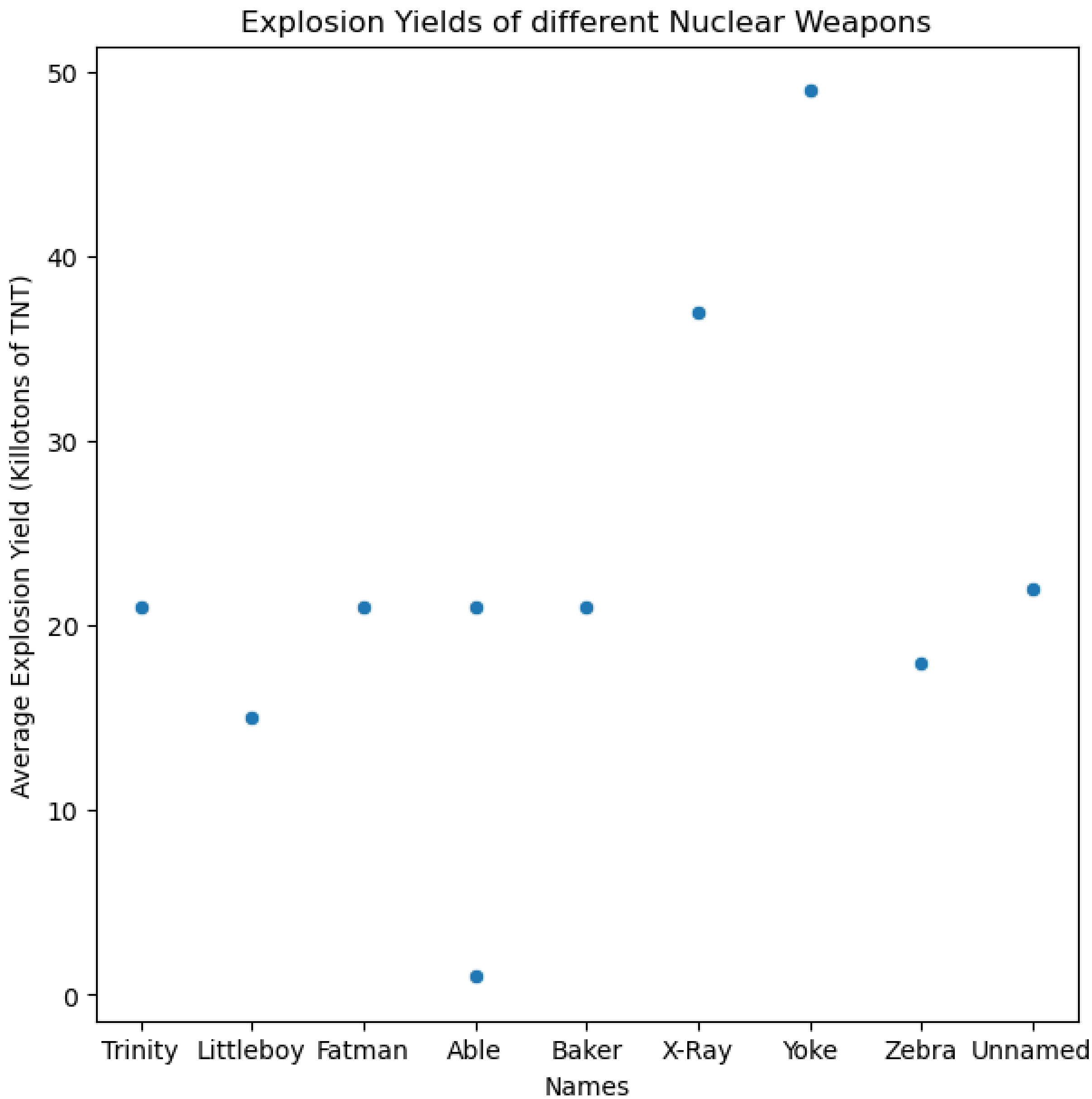
Plot Relationships

In [35]:

```
# Some explosion yields (first 10)
plt.figure(figsize=(7,7))
sns.scatterplot(x = nukes["Name"][:10], y = nukes["Explosion Yield Average"][:10])
plt.title("Explosion Yields of different Nuclear Weapons")
plt.xlabel("Names")
plt.ylabel("Average Explosion Yield (Killotons of TNT)")
```

Out[35]:

```
Text(0, 0.5, 'Average Explosion Yield (Killotons of TNT)')
```



In [46]:

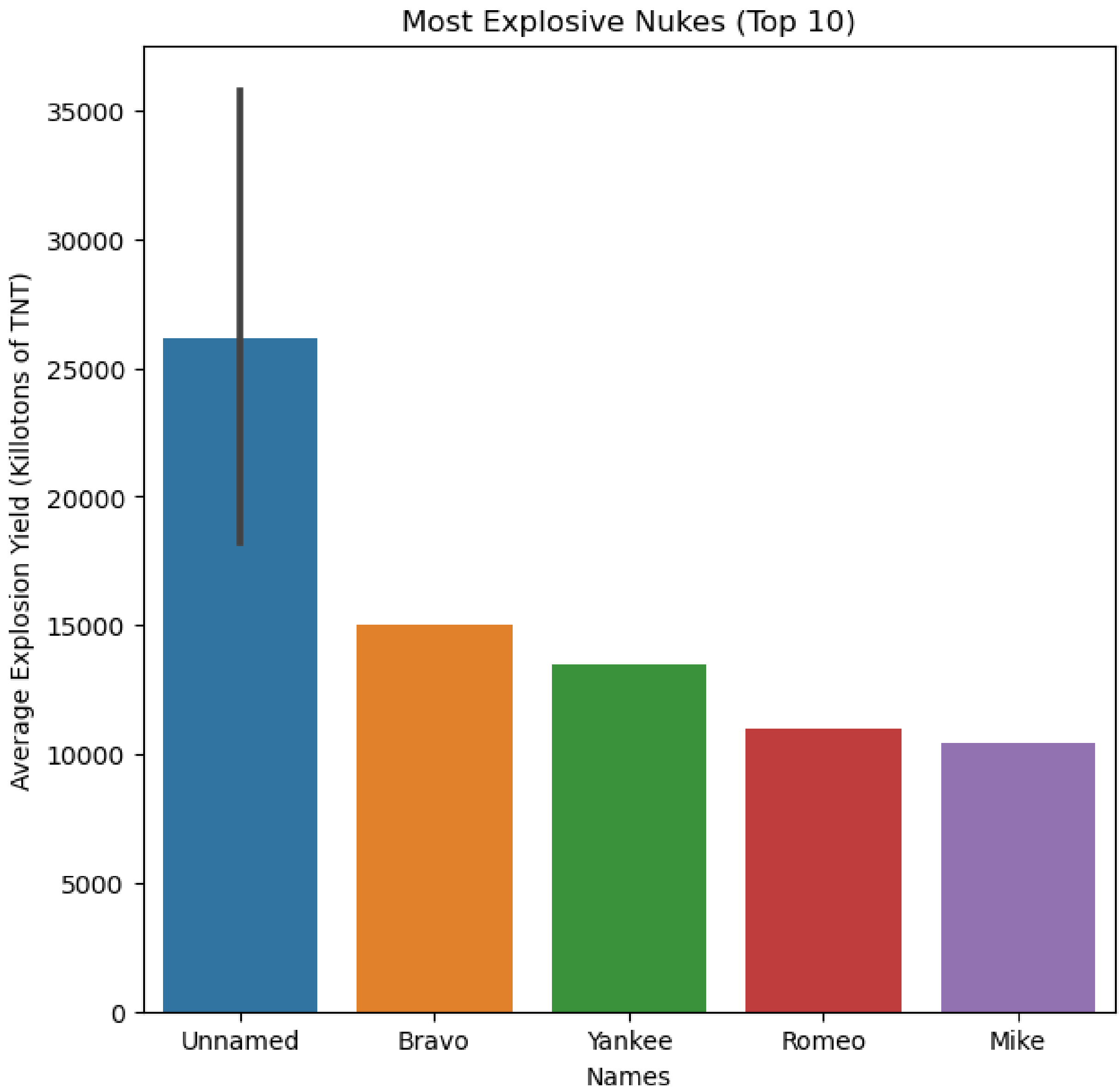
```
# Nukes with the biggest explosions (i.e. yiels)
nukes_by_top_explosions = nukes.sort_values(by="Explosion Yield Average", ascending=Fa

plt.figure(figsize=(7,7))
sns.barplot(x=nukes_by_top_explosions["Name"][:10], y=nukes_by_top_explosions["Explosi
plt.title("Most Explosive Nukes (Top 10)")
plt.ylabel("Average Explosion Yield (Killotons of TNT)")
plt.xlabel("Names")

# plt.show()
```

Out[46]:

```
Text(0.5, 0, 'Names')
```



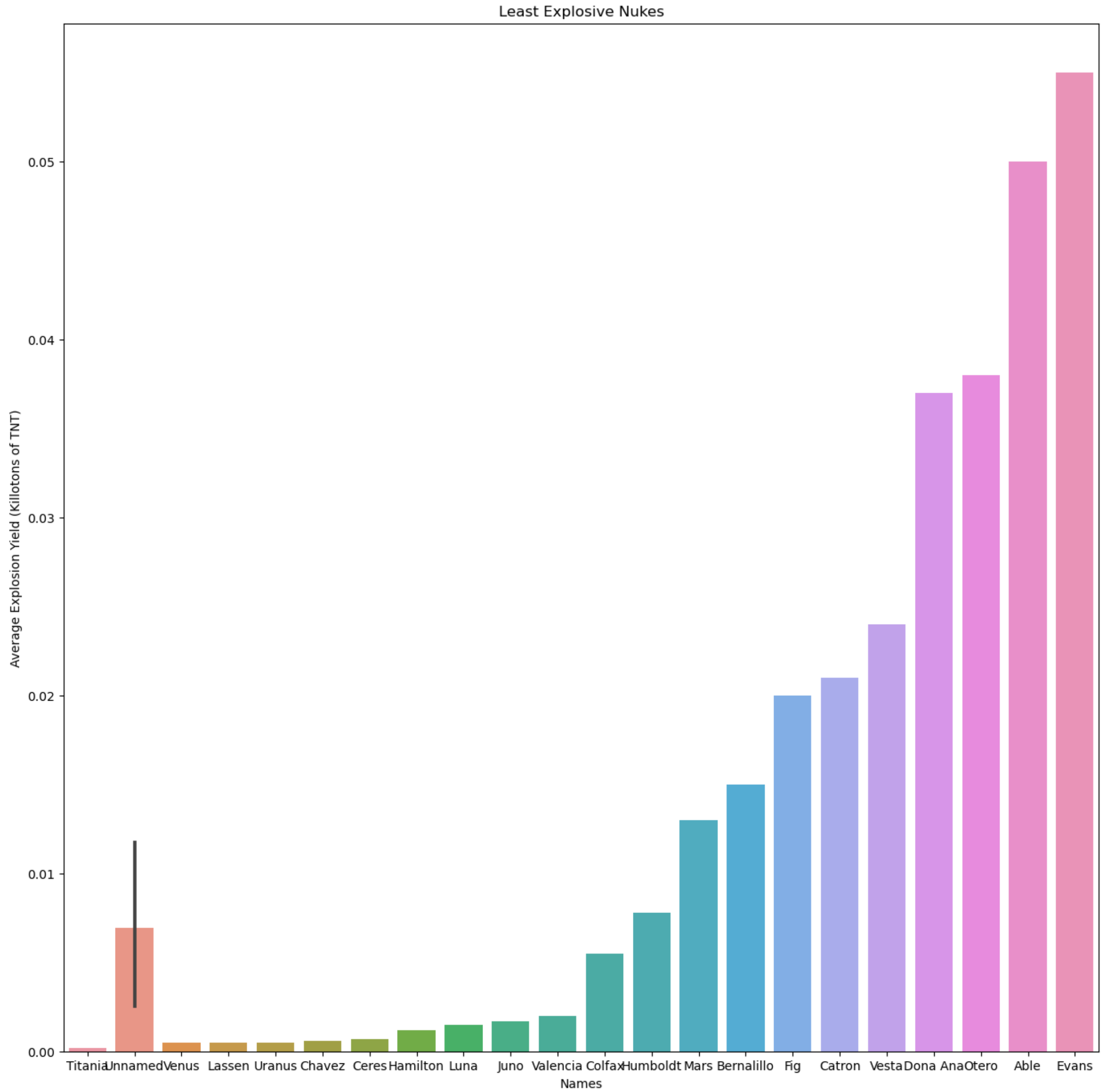
In [47]:

```
# Nukes with the smallest explosions (i.e. yiels)
nukes_by_least_explosions = nukes.sort_values(by="Explosion Yield Average", ascending=
zero_explosions = nukes_by_least_explosions[nukes_by_least_explosions["Explosion Yiel
nukes_by_least_explosions = nukes_by_least_explosions.drop(zero_explosions.index)

plt.figure(figsize=(15,15))
sns.barplot(x=nukes_by_least_explosions["Name"][:50], y=nukes_by_least_explosions["Exp
plt.title("Least Explosive Nukes")
plt.ylabel("Average Explosion Yield (Killotons of TNT)")
plt.xlabel("Names")
```

Out[47]:

```
Text(0.5, 0, 'Names')
```



In [48]:
```
nukes_by_least_explosions["Explosion Yield Average"][:50]
```

Out[48]:
```
296     0.0002
1555    0.0005
68      0.0005
1010    0.0005
186     0.0005
1444    0.0005
1447    0.0005
1133    0.0005
884     0.0005
1227    0.0005
544     0.0005
1207    0.0005
141     0.0005
273     0.0005
1504    0.0005
1507    0.0005
362     0.0005
1610    0.0005
1619    0.0005
1512    0.0005
524     0.0005
1640    0.0005
193     0.0005
1706    0.0005
528     0.0005
290     0.0006
287     0.0007
266     0.0012
244     0.0015
284     0.0017
247     0.0020
324     0.0040
257     0.0055
545     0.0070
292     0.0078
1414    0.0100
248     0.0130
242     0.0150
234     0.0200
283     0.0210
269     0.0240
546     0.0280
64      0.0300
326     0.0300
529     0.0310
268     0.0370
241     0.0380
286     0.0500
20      0.0500
291     0.0550
Name: Explosion Yield Average, dtype: float64
```

which contry contributed the most to this dataset

In [49]:
```
print(nukes["Source"].unique())
```

```
['DOE' 'MTM' 'UGS' 'ISC' 'DIS' 'SPA' 'ZAR' 'WTN' 'HFS' 'MTU' 'NRD' 'BKY'
 'NOA']
```

In [50]:
```
# Country of origin
countries = {"DOE":"United States", "MTM":"Russia", "ISC":"UK", "UGS":"United States",
             "ZAR":"Sweden", "WTN":"New Zealand", "HFS":"Sweden", "MTU":"United States"
              "NOA":"Norway"}
```

In [52]:
```
# New country sourse feature:
nukes["Country Source"] = nukes["Source"].apply(lambda x: countries[x] if x in countri
```

In [53]:
```
nukes.head()
```

Out[53]:

	Source Country	Deployment Location	Source	Latitude	Longitude	Body Wave Magnitude	Surface Wave Magnitude	Depth	Explosion Yield L	Ex
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

In [54]:
```
nukes.tail()
```

Out[54]:

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

In [55]:
```
# The number of different countries in the dataset
print("Number of Countries: ", len(nukes["Country Source"].unique()))
```

```
Number of Countries:  8
```

In [56]:
```
# Initialise array to hold the amounts
i = 0
country_sums = [0,0,0,0,0,0,0,0]
```

```
# Loops through each country and adds the amount to the array
for country in nukes["Country Source"].unique():
    num = len(nukes[nukes["Country Source"] == country])
    country_sums[i] = num
    i+=1
```

In [57]:
```
print(nukes["Country Source"].unique())
print("Country Sums: ", country_sums)
```

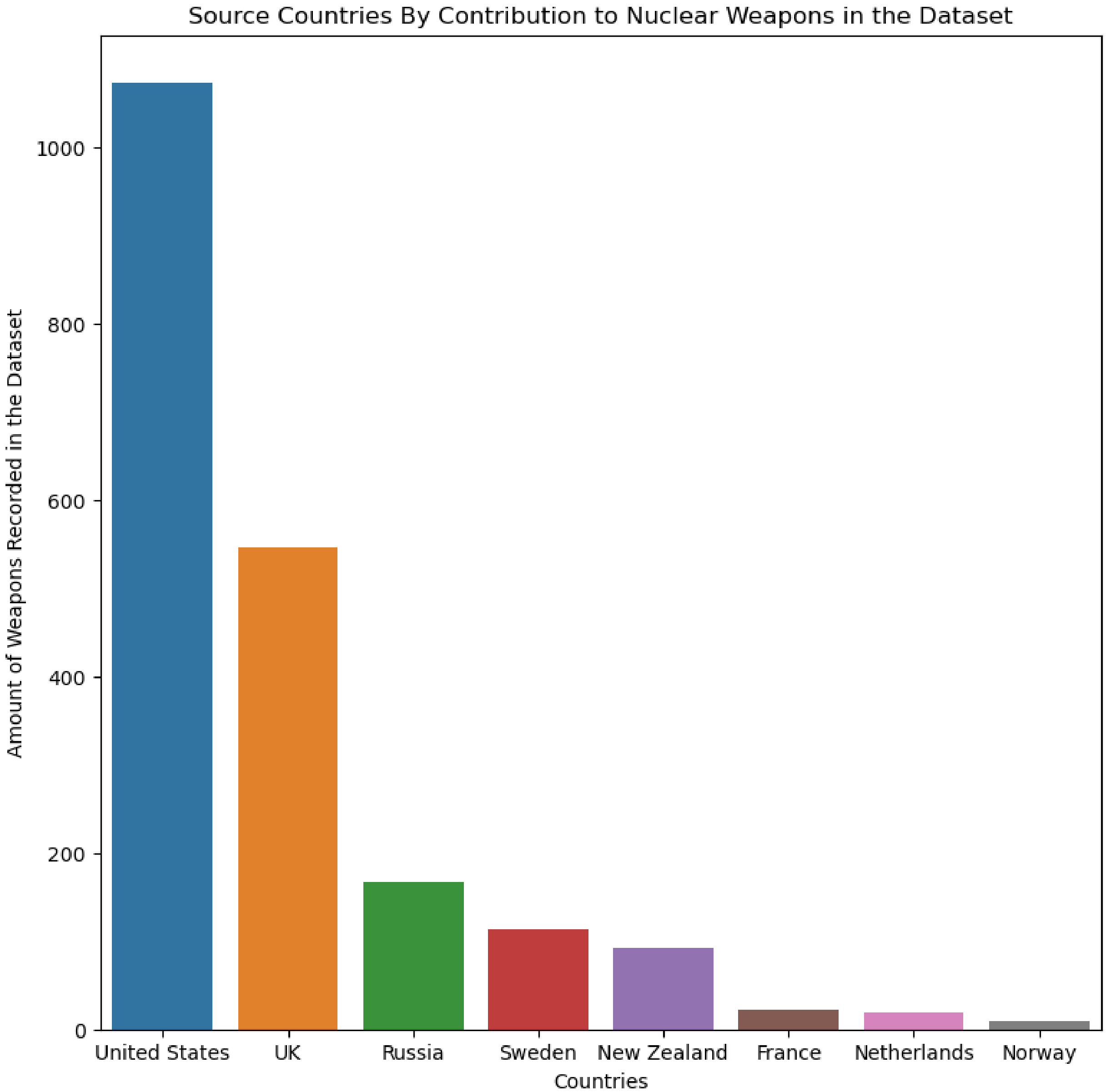
```
['United States' 'Russia' 'UK' 'Netherlands' 'France' 'Sweden'
 'New Zealand' 'Norway']
Country Sums:  [1073, 167, 545, 19, 23, 114, 93, 9]
```

In [58]:
```
country_contribution = pd.Series(country_sums, index=["United States", "Russia", "UK",
print(country_contribution)
```

```
United States    1073
Russia            167
UK                545
Netherlands        19
France             23
Sweden            114
New Zealand        93
Norway              9
dtype: int64
```

In [63]:
```
country_contribution = country_contribution.sort_values(ascending=False)
plt.figure(figsize=(9,9))
sns.barplot(x=country_contribution.index, y=country_contribution)
plt.title("Source Countries By Contribution to Nuclear Weapons in the Dataset")
plt.ylabel("Amount of Weapons Recorded in the Dataset")
plt.xlabel("Countries")
```

Out[63]:
```
Text(0.5, 0, 'Countries')
```


Source Countries By Contribution to Nuclear Weapons in the Dataset
Amount of Weapons Recorded in the Dataset
1000
800
600
400
200
0
United States
UK
Russia
Sweden
New Zealand
France
Netherlands
Norway
Countries

```
In [ ]:
```