Data Analysis: DB Table `io_ntsb_2002_2021`

Note: The **IO-AVSTATS-DB** database used here contains **NTSB** aircraft event data as of January 8, 2023.

1. Introduction

The **NTSB** makes available on its website statistical data on flight events since 1982 in the form of MS Access database files. Events are classified as accidents and incidents according to § 830.2 Definitions in the Code of Federal Regulations. The following file types can be downloaded from the website (link):

- `Pre2008.zip`: contains data from events that happened before the year 2008.
- `avall.zip`: contains data of events that happened since 2008 until the current beginning of the month.
- `up99MON.zip`: At the 1st, 8th, 15th and 22nd of each month an update file with new or changed events. These updates are available for one year.

IO-Aero has loaded the data from the MS Access files `Pre2008` and `avall` once into the PostgreSQL database **IO-AVSTATS-DB** in November 2022 and since then regularly updates the **IO-AVSTATS-DB** with the update files provided by **NTSB**,

In the November 17, 2021, news release U.S. Civil Aviation Fatalities and Flight Activity Decreased in 2020{:target="_blank"}, the **NTSB** published, among other things, the US Civil Aviation Accident Statistics{:target="_blank"} - hereinafter referred to as **20-Year Statistics**. These are available on this website at this link{:target="_blank"} as an MS Excel file. This file contains 28 worksheets (Table 1 through Table 28) of accumulated data, and in Worksheet 29 (Table 29. Accident Aircraft, 2002 through 2021, US Civil Aviation) (most likely) the underlying event and aircraft details.

Beginning of file:

Table 29. Accident Aircraft, 2002 through 2021, US Civil Aviation

NTSB Number	Accident Report	Event Date	City	State or Region	Country	Latitude
MIA02FA048	Report	01.01.2002	Hollywood	Florida	United States	26.062778
NYC02LA046	Report	01.01.2002	Sterling	Massachusetts	United States	42.454723
ATL02LA029	Report	02.01.2002	Greenville	South Carolina	United States	34.885833
SEA02FA023	Report	02.01.2002	Boise	Idaho	United States	43.5597
SEA02TA022	Report	03.01.2002	Butte	Montana	United States	45.958057
CHI02LA057	Report	03.01.2002	Lake Leelanau	Michigan	United States	44.969924
LAX02FA059	Report	04.01.2002	Petaluma	California	United States	38.229011
DCA02RA014	Report	04.01.2002	Birmingham		United Kingdom	
ATL02TA030	Report	04.01.2002	Tampa	Florida	United States	27.975276
ATL02FA031	Report	05.01.2002	Rio Grande	Puerto Rico	United States	18.317777

Longitude	Fatal Injuries	Serious Injuries	Highest Injury Level	Aircraft Number	Damage Level	Registration Number	Aircraft Category
-80.108886	1	4	Fatal	1	Substantial	N3525Y	Airplane
-71.733329			None	1	Substantial	N117BB	Glider
-82.217498			None	1	Substantial	N262FE	Airplane
-116.21025			None	1	Substantial	N132Z	Airplane
-112.483329			None	1	Substantial	N8393F	Helicopter
-85.73085			None	1	Substantial	N302AC	Airplane
-122.56031	1		Fatal	1	Destroyed	N24223	Airplane
	5		Fatal	1	Destroyed	N90AG	Airplane
-82.533058			Minor	1	Substantial	N46TP	Helicopter
-65.767219	5		Fatal	1	Destroyed	N441AW	Airplane

Aircraft Make	Aircraft Model	Flight Regulation	Flight Schedule Type	Purpose of Flight
Piper	PA-31-350	Part 135: Air taxi & commuter	Non-scheduled	
LET	L-23	Part 91: General aviation		Instructional
Boeing	727-200	Part 121: Air carrier	Non-scheduled	
Beech	58P	Part 91: General aviation		Flight test
Hughes	369D	Public aircraft		Public aircraft
Aeronca	11AC	Part 91: General aviation		Personal
Cessna	152	Part 91: General aviation		Unknown
Canadair	Challenger 604	Non-U.S., non-commercial		Executive/Corporate
Hughes	OH-6A	Public aircraft		Public aircraft
Cessna	441	Part 91: General aviation		Personal

Intentional Act	Defining Event	Phase of Flight

Unfortunately, **NTSB** does not provide sufficient documentation on the statistical data provided. For this reason, a project was started at **IO-Aero** to gain more information about the structure of the statistical data. In the first step, the data from worksheet 29 of the MS Excel file were loaded unchanged into a new table of the database **IO-AVSTATS-DB**. On this basis, the following three questions were now investigated:

1. how are the data in worksheet 29 structured, e.g. with regard to categorization?
2. how can accumulated data, e.g. in worksheet 10, be derived from the data in worksheet 29?
3. how can the data in the MS Excel file be compared with the data in the MS Access files in the period 2002 to 2021?

2.DB Table `io_ntsb_2002_2021`

To store the data from Worksheet 29 of the MS Excel file containing the **20-Year Statistics** in the **IO-AVSTATS-DB** database, the new database table `io_ntsb_2002_2021` was defined as follows:

Column Name	#	Data type	Identi...	Comme...
ABC ntsb_number	1	varchar(50)		
ABC accident_report	2	text		
⏱ event_date	3	timestamp		
123 ev_year	4	int2		
ABC city	5	varchar(50)		
ABC state_or_region	6	varchar(50)		
ABC ev_state	7	varchar(2)		
ABC country	8	varchar(50)		
ABC ev_country	9	varchar(4)		
123 latitude	10	float8		
123 longitude	11	float8		
123 fatal_injuries	12	int2		
123 serious_injuries	13	int2		
ABC highest_injury_level	14	varchar(50)		
123 aircraft_number	15	int4		
ABC damage_level	16	varchar(50)		
ABC registration_number	17	varchar(50)		
ABC aircraft_category	18	varchar(50)		
ABC aircraft_make	19	varchar(50)		
ABC aircraft_model	20	varchar(50)		
ABC flight_regulation	21	varchar(50)		
ABC flight_schedule_type	22	varchar(50)		
ABC purpose_of_flight	23	varchar(50)		
☑ intentional_act	24	bool		
ABC defining_event	25	varchar(50)		
ABC phase_of_flight	26	varchar(50)		

The data from the MS Excel file were loaded unchanged into the new database table. To simplify the use of the database table, only the columns `ev_year`, `ev_state` and `ev_country`, derived from the columns `event_date`, `state_or_region` and `country`, were added. The header lines and the empty lines for the loading process were ignored but recorded in the log file:

```
Progress update 2023-01-15 12:46:10.973510 :
===============================================================================.
Progress update 2023-01-15 12:46:10.973510 : INFO.00.004 Start Launcher.
Progress update 2023-01-15 12:46:10.979008 : INFO.00.001 The logger is configured
and ready.
Progress update 2023-01-15 12:46:18.297008 : INFO.00.041 Arguments task='l_n_s'
{msexecel}='AviationAccidentStatistics_2002-2021_20221208'.
Progress update 2023-01-15 12:46:18.297008 : -------------------------------------
---------------------------------------------.
Progress update 2023-01-15 12:46:18.297008 : INFO.00.072 Loading NTSB MS Ecel
statistic data from file 'AviationAccidentStatistics_2002-2021_20221208'.
Progress update 2023-01-15 12:46:18.297508 : -------------------------------------
--------------------------------------------
Unprocessed row #     1: Table 29. Accident Aircraft, 2002 through 2021, US Civil
Aviation | None | None | ...
Unprocessed row #     2: None | None | None | ...
Unprocessed row #     3: NTSB Number | Accident Report | Event Date | ...
Progress update 2023-01-15 12:48:30.355445 : Number of rows so far read :   5000.
```

```
Progress update 2023-01-15 12:50:35.554697 : Number of rows so far read :  10000.
Progress update 2023-01-15 12:52:39.895361 : Number of rows so far read :  15000.
Progress update 2023-01-15 12:54:44.828003 : Number of rows so far read :  20000.
Progress update 2023-01-15 12:56:47.277567 : Number of rows so far read :  25000.
Progress update 2023-01-15 12:58:50.693799 : Number of rows so far read :  30000.
Unprocessed row # 30245: None | None | None | ...
...
Unprocessed row # 30729: None | None | None | ...
Progress update 2023-01-15 12:58:59.416221 : Number rows selected :  30729.
Progress update 2023-01-15 12:58:59.416723 : Number rows inserted :  30241.
Progress update 2023-01-15 12:58:59.416723 : Number rows updated  :  90723.
Progress update 2023-01-15 12:58:59.416723 : ------------------------------------
------------------------------------------.
Progress update 2023-01-15 12:58:59.417222 :      768,612,714,000 ns - Total time
launcher.
Progress update 2023-01-15 12:58:59.417222 : INFO.00.006 End   Launcher.
Progress update 2023-01-15 12:58:59.417222 :
=============================================================================.
```

2.1 Data Migration Verification

According to the log file, 30'241 rows were loaded into the database table which exactly matches the MS Excel file where the data is stored in Excel rows 4 to 30'244.Summing the columns `Fatal Injuries` (I) and `Serious Injuries` (J) gives 10,245 and 5,700 respectively. These numbers can be confirmed with the following query in the database table `io_ntsb_2002_2021`:

```
SELECT count(*)              "Accidents All",
       sum(fatal_injuries)   "Fatal Injuries",
       sum(serious_injuries) "Serious Injuries"
FROM io_ntsb_2002_2021
```

Results:

```
Accidents All|Fatal Injuries|Serious Injuries|
-------------+--------------+----------------+
       30241|         10245|            5700|
```

The following database query can be used to verify that the **20-Year Statistics** data is still contained in the current MS Access databases:

```
SELECT ntsb_number, ev_year
FROM io_ntsb_2002_2021 in2
WHERE (ntsb_number, aircraft_number) NOT IN (SELECT e.ntsb_no, a.aircraft_key
                                    FROM events e INNER JOIN
aircraft a
```

```
                                                          ON e.ev_id =
  a.ev_id)
```

```
ntsb_number|ev_year|
-----------+-------+
CEN21LA236 |   2021|
```

This one event is actually missing from the MS Access databases, although the report is still available. This one case can certainly be neglected, but it clearly shows that the data on which the **20-Year Statistics** are based could have been changed afterwards.

3.Data Characteristic of Worksheet no. 29

An appropriate adaption of the following database query was used to analyze the data categories:

```
    SELECT <category>                                "<category>",
           count(*)                                  "Accidents All",
           count(*) FILTER (WHERE fatal_injuries > 0) "Accidents Fatal",
           sum(fatal_injuries)                       "Fatalities"
      FROM io_ntsb_2002_2021
     GROUP BY <category>
     ORDER BY 1
```

On the data categorization view, the following picture emerges:

3.1 `aircraft_category`

```
aircraft_category|Accidents All|Accidents Fatal|Fatalities|
-----------------+-------------+---------------+----------+
                 |            1|              1|        12|
Airplane         |        25995|           4880|      8956|
Balloon          |          241|             25|        49|
Blimp            |            3|              0|          |
Glider           |          536|            104|       121|
Gyroplane        |          174|             46|        54|
Helicopter       |         3050|            509|       971|
Powered-lift     |            3|              0|          |
Powered parachute|           74|             12|        15|
Ultralight       |           13|              2|         3|
Unknown          |            1|              1|         1|
Weight-shift     |          150|             50|        63|
```

3.2 `aircraft_number`

```
aircraft_number|Accidents All|Accidents Fatal|Fatalities|
---------------+------------+--------------+----------+
             1|       29887|          5530|      9850|
             2|         347|            97|       388|
             3|           6|             2|         6|
             4|           1|             1|         1|
```

I. Duplication of events per aircraft involved

- The same event is included in the MS Excel file for each aircraft involved. It must be ensured that these events differ only in the aircraft data:

```sql
SELECT ntsb_number, count(*)
  FROM io_ntsb_2002_2021 in2
 WHERE ntsb_number IN (SELECT in3.ntsb_number
                         FROM io_ntsb_2002_2021 in3
                         GROUP BY in3.ntsb_number
                         HAVING count(*) > 1)
  GROUP BY ntsb_number, event_date, city, state_or_region, country,
           latitude, longitude, fatal_injuries, serious_injuries,
highest_injury_level
    HAVING count(*) = 1
     ORDER BY ntsb_number
```

```
ntsb_number|count|
-----------+-----+
```

No inconsistencies found.

3.3 country

(sorted by Accidents All descending)

```
country                       |Accidents All|Accidents Fatal|Fatalities|
------------------------------+------------+--------------+----------+
United States                 |       29697|          5357|      9453|
Bahamas                       |          57|            30|        82|
Mexico                        |          48|            33|        70|
Canada                        |          46|            25|        47|
France                        |          38|            22|        55|
Germany                       |          28|            15|        29|
United Kingdom                |          28|            13|        28|
Dominican Republic            |          17|            12|        25|
Italy                         |          15|             7|         8|
                              |          13|             5|        11|
Guatemala                     |          11|             7|        13|
```

Japan	11	2	4
Colombia	11	6	12
Brazil	9	5	165
Venezuela	9	3	7
Unknown	9	3	5
Spain	9	6	15
Switzerland	7	4	6
Argentina	7	2	6
China	6	2	2
Austria	6	4	10
Costa Rica	6	4	16
Afghanistan	6	3	16
Guadeloupe	5	0	
Ireland	5	2	4
Netherlands Antilles	5	1	2
Panama	5	2	13
Malaysia	5	2	4
Iceland	5	4	6
Poland	4	2	12
South Africa	4	3	11
Belgium	4	2	7
Honduras	4	3	12
British Virgin Islands	4	1	1
Philippines	3	0	0
Turks And Caicos Islands	3	2	16
American Samoa	3	1	2
Romania	3	1	1
Greenland	3	3	3
United Arab Emirates	3	2	6
El Salvador	3	2	5
Uruguay	3	1	1
Hungary	3	0	
Australia	3	1	3
Chile	2	1	1
Dominica	2	1	2
Kiribati	2	1	1
Congo	2	2	5
Bermuda	2	0	
Nicaragua	2	0	
Guyana	2	2	5
Sweden	2	0	
Haiti	2	2	7
St Kitts And Nevis	2	0	
Cuba	2	0	
Antarctica	2	0	
Peru	2	1	2
Jamaica	2	1	3
Iraq	2	1	3
Nigeria	2	1	2
Northern Mariana Islands	2	0	
New Zealand	2	1	2
Russia	2	0	
Indonesia	2	1	1
Netherlands	2	0	

```
Republic Of Korea               |        1|        0|         |
Czech Republic                  |        1|        1|        1|
Jordan                          |        1|        0|         |
Singapore                       |        1|        0|         |
Papua New Guinea                |        1|        1|        1|
Barbados                        |        1|        0|         |
Saudi Arabia                    |        1|        1|        1|
Cayman Islands                  |        1|        0|         |
Marshall Islands                |        1|        0|         |
Slovenia                        |        1|        1|        4|
Greece                          |        1|        0|         |
India                           |        1|        0|         |
Israel                          |        1|        0|         |
Suriname                        |        1|        0|         |
Denmark                         |        1|        0|         |
Mozambique                      |        1|        0|         |
Qatar                           |        1|        1|        1|
Paraguay                        |        1|        1|        1|
Federated States Of Micronesia  |        1|        0|         |
Martinique                      |        1|        0|         |
Angola                          |        1|        0|         |
Lithuania                       |        1|        1|        1|
Sudan                           |        1|        1|        2|
Morocco                         |        1|        1|        4|
Solomon Islands                 |        1|        1|        1|
```

Without duplication of events caused by involved aircraft, i.e. only including events with the value '1' in the column `aircraft_number`:

```
country                         |Accidents All|Accidents Fatal|Fatalities|
--------------------------------+-------------+---------------+----------+
United States                   |        29347|           5261|      9217|
Bahamas                         |           57|             30|        82|
Mexico                          |           48|             33|        70|
Canada                          |           44|             23|        43|
France                          |           38|             22|        55|
Germany                         |           28|             15|        29|
United Kingdom                  |           28|             13|        28|
Dominican Republic              |           17|             12|        25|
Italy                           |           15|              7|         8|
                                |           13|              5|        11|
Japan                           |           11|              2|         4|
Colombia                        |           11|              6|        12|
Guatemala                       |           11|              7|        13|
Unknown                         |            9|              3|         5|
Venezuela                       |            9|              3|         7|
Spain                           |            9|              6|        15|
Brazil                          |            8|              4|        11|
Argentina                       |            7|              2|         6|
Switzerland                     |            7|              4|         6|
China                           |            6|              2|         2|
```

Costa Rica	6	4	16	
Austria	6	4	10	
Afghanistan	6	3	16	
Ireland	5	2	4	
Malaysia	5	2	4	
Iceland	5	4	6	
Guadeloupe	5| 0|	
Netherlands Antilles	5	1	2	
Panama	5	2	13	
Belgium	4	2	7	
South Africa	4	3	11	
Honduras	4	3	12	
Poland	4	2	12	
British Virgin Islands	4	1	1	
Philippines	3	0	0	
Turks And Caicos Islands	3	2	16	
American Samoa	3	1	2	
Greenland	3	3	3	
El Salvador	3	2	5	
Australia	3	1	3	
Hungary	3| 0|	
Uruguay	3	1	1	
United Arab Emirates	3	2	6	
Chile	2	1	1	
Dominica	2	1	2	
Kiribati	2	1	1	
Congo	2	2	5	
Bermuda	2| 0|	
Nicaragua	2| 0|	
Guyana	2	2	5	
Sweden	2| 0|	
Haiti	2	2	7	
St Kitts And Nevis	2| 0|	
Cuba	2| 0|	
Antarctica	2| 0|	
Peru	2	1	2	
Jamaica	2	1	3	
Iraq	2	1	3	
Nigeria	2	1	2	
Northern Mariana Islands	2| 0|	
New Zealand	2	1	2	
Russia	2| 0|	
Indonesia	2	1	1	
Netherlands	2| 0|	
Romania	2| 0|	
Republic Of Korea	1| 0|	
Czech Republic	1	1	1	
Jordan	1| 0|	
Papua New Guinea	1	1	1	
Singapore	1| 0|	
Barbados	1| 0|	
Saudi Arabia	1	1	1	
Cayman Islands	1| 0|	
Marshall Islands	1| 0|	

```
Slovenia                       |           1|           1|         4|
Greece                         |           1|           0|          |
India                          |           1|           0|          |
Israel                         |           1|           0|          |
Suriname                       |           1|           0|          |
Denmark                        |           1|           0|          |
Mozambique                     |           1|           0|          |
Qatar                          |           1|           1|         1|
Paraguay                       |           1|           1|         1|
Federated States Of Micronesia |           1|           0|          |
Martinique                     |           1|           0|          |
Angola                         |           1|           0|          |
Lithuania                      |           1|           1|         1|
Sudan                          |           1|           1|         2|
Morocco                        |           1|           1|         4|
Solomon Islands                |           1|           1|         1|
```

3.4 damage_level

```
damage_level|Accidents All|Accidents Fatal|Fatalities|
------------+-------------+---------------+----------+
            |            2|              2|         2|
Destroyed   |         3586|           2797|      5674|
Minor       |          256|             35|       195|
None        |          493|             37|        44|
Substantial |        25900|           2759|      4330|
Unknown     |            4|              0|          |
```

3.5 defining_event

```
defining_event                    |Accidents All|Accidents Fatal|Fatalities|
----------------------------------+-------------+---------------+----------+
                                  |        10870|           2142|      4097|
Abnormal Runway Contact           |         2522|             34|        43|
Abrupt Maneuver                   |          136|             55|       105|
Aerodrome                         |           21|              1|         1|
Air Traffic Management            |            2|              1|         2|
Bird Strike                       |          128|              9|        28|
Cabin Safety Events               |           54|              2|         2|
Collision on Takeoff or Landing   |          487|             48|       105|
Controlled Flight Into Terrain    |          527|            294|       588|
Evacuation                        |            2|              0|          |
External Load                     |           22|              7|         8|
Fire - Non-Impact                 |          135|             21|        40|
Fire - Post-Impact                |            1|              0|          |
Fuel Related                      |         1137|            135|       204|
Glider Towing                     |           15|              3|         5|
Ground Collision                  |          376|              6|        15|
Ground Handling                   |          121|             18|        24|
```

```
Icing                              |       24|        10|        15|
Loss of Control In-Flight          |     3403|      1486|      2625|
Loss of Control on Ground          |     2923|        35|        53|
Loss of Lift                       |      137|         9|        19|
Low Altitude Operation             |      341|       116|       166|
Medical Event                      |       14|        11|        12|
Midair                             |      213|       111|       296|
Navigation Error                   |       13|         3|         4|
Other                              |      959|       171|       274|
Runway Excursion                   |      442|        11|        28|
Runway Incursion - Vehicle         |       15|         4|         6|
Security Related                   |       11|         7|         8|
Simulated/training event           |       11|         2|         3|
System/Component Failure - Non-power |     886|       139|       247|
System/Component Failure - Powerplant|    3169|       335|       504|
Turbulence Encounter               |      205|        16|        22|
Undershoot/Overshoot               |      252|         3|         9|
Unintended Flight Into IMC         |      249|       173|       317|
Unknown                            |      284|       189|       323|
Wildlife Encounter                 |       58|         0|         0|
Windshear/Thunderstorm             |       76|        23|        47|
```

3.6 `ev_year` via `event_date`

```
ev_year|Accidents All|Accidents Fatal|Fatalities|
-------+-------------+---------------+----------+
   2002|         1837|            367|       624|
   2003|         1890|            381|       723|
   2004|         1735|            346|       648|
   2005|         1804|            340|       613|
   2006|         1626|            326|       787|
   2007|         1765|            308|       551|
   2008|         1688|            305|       593|
   2009|         1572|            285|       559|
   2010|         1527|            284|       491|
   2011|         1578|            293|       510|
   2012|         1556|            285|       456|
   2013|         1306|            238|       436|
   2014|         1302|            268|       451|
   2015|         1296|            239|       411|
   2016|         1355|            228|       427|
   2017|         1331|            212|       349|
   2018|         1366|            234|       402|
   2019|         1322|            255|       467|
   2020|         1152|            215|       369|
   2021|         1233|            221|       378|
```

Without duplication of events caused by involved aircraft, i.e. only including events with the value '1' in the column `aircraft_number`:

```
ev_year|Accidents All|Accidents Fatal|Fatalities|
-------+-------------+--------------+----------+
   2002|         1821|           362|       615|
   2003|         1869|           373|       699|
   2004|         1719|           339|       637|
   2005|         1779|           332|       598|
   2006|         1609|           320|       620|
   2007|         1745|           303|       540|
   2008|         1660|           299|       568|
   2009|         1558|           279|       541|
   2010|         1507|           278|       477|
   2011|         1556|           286|       499|
   2012|         1538|           281|       450|
   2013|         1296|           235|       429|
   2014|         1290|           263|       442|
   2015|         1281|           238|       406|
   2016|         1336|           221|       408|
   2017|         1316|           211|       347|
   2018|         1346|           230|       394|
   2019|         1302|           250|       455|
   2020|         1138|           210|       349|
   2021|         1221|           220|       376|
```

3.7 fatal_injuries

```
fatal_injuries|Accidents All|Accidents Fatal|Fatalities|
--------------+-------------+--------------+----------+
             0|          715|             0|         0|
             1|         3072|          3072|      3072|
             2|         1622|          1622|      3244|
             3|          481|           481|      1443|
             4|          266|           266|      1064|
             5|          101|           101|       505|
             6|           37|            37|       222|
             7|           19|            19|       133|
             8|            6|             6|        48|
             9|            8|             8|        72|
            10|            6|             6|        60|
            11|            3|             3|        33|
            12|            1|             1|        12|
            13|            1|             1|        13|
            14|            1|             1|        14|
            16|            1|             1|        16|
            20|            1|             1|        20|
            21|            1|             1|        21|
            49|            1|             1|        49|
            50|            1|             1|        50|
           154|            1|             1|       154|
              |        23896|             0|          |
```

Without duplication of events caused by involved aircraft, i.e. only including events with the value '1' in the column `aircraft_number`:

```
fatal_injuries|Accidents All|Accidents Fatal|Fatalities|
-------------+------------+--------------+---------+
            0|         708|             0|        0|
            1|        3038|          3038|     3038|
            2|        1593|          1593|     3186|
            3|         463|           463|     1389|
            4|         259|           259|     1036|
            5|          95|            95|      475|
            6|          36|            36|      216|
            7|          17|            17|      119|
            8|           5|             5|       40|
            9|           7|             7|       63|
           10|           6|             6|       60|
           11|           3|             3|       33|
           12|           1|             1|       12|
           13|           1|             1|       13|
           14|           1|             1|       14|
           16|           1|             1|       16|
           20|           1|             1|       20|
           21|           1|             1|       21|
           49|           1|             1|       49|
           50|           1|             1|       50|
             |       23649|             0|         |
```

3.8 `flight_regulation`

```
flight_regulation          |Accidents All|Accidents Fatal|Fatalities|
---------------------------+------------+--------------+---------+
Armed Forces               |           1|             0|         |
Non-U.S., non-commercial   |         288|           171|      394|
Part 121: Air carrier      |         657|            20|      180|
Part 125: 20+ pax,6000+ lbs|           9|             3|        5|
Part 133: Rotorcraft ext. load|       151|            36|       42|
Part 135: Air taxi & commuter |      1054|           233|      621|
Part 137: Agricultural     |        1442|           157|      164|
Part 91: General aviation  |       26256|          4925|     8665|
Part 91 subpart k: Fractional |         8|             0|        0|
Public aircraft            |         349|            70|      125|
Unknown                    |          26|            15|       49|
```

3.9 `flight_schedule_type`

```
flight_schedule_type|Accidents All|Accidents Fatal|Fatalities|
--------------------+------------+--------------+---------+
                    |       28266|          5319|     9349|
```

```
Non-scheduled             |           1292|           290|         710|
Scheduled                 |            683|            21|         186|
```

3.10 `highest_injury_level`

```
highest_injury_level|Accidents All|Accidents Fatal|Fatalities|
--------------------+-------------+---------------+----------+
                    |           96|              7|        12|
Fatal               |         5623|           5623|     10233|
Minor               |         4577|              0|         0|
None                |        16426|              0|         0|
Serious             |         3519|              0|         0|
```

Without duplication of events caused by involved aircraft, i.e. only including events with the value '1' in the column `aircraft_number`:

```
highest_injury_level|Accidents All|Accidents Fatal|Fatalities|
--------------------+-------------+---------------+----------+
                    |           94|              7|        12|
Fatal               |         5523|           5523|      9838|
Minor               |         4548|              0|         0|
None                |        16221|              0|         0|
Serious             |         3501|              0|         0|
```

The question here is whether the values in the three columns `highest_injury_level`, `fatal_injuries` and `serious_injuries` are consistent:

I. `highest_injury_level` and `fatal_injuries`

- For each column where `highest_injury_level` equals `Fatal` the value of the column `fatal_injuries` must be greater than zero:

```
SELECT ntsb_number, highest_injury_level, fatal_injuries
  FROM io_ntsb_2002_2021 in2
 WHERE highest_injury_level = 'Fatal'
   AND fatal_injuries = 0
 ORDER BY 1
```

```
ntsb_number|highest_injury_level|fatal_injuries|
-----------+--------------------+--------------+
```

No inconsistencies found.

- For each column where `fatal_injuries` greater than zero the value of the column `highest_injury_level` must be `Fatal`:

```
SELECT ntsb_number, highest_injury_level, fatal_injuries
  FROM io_ntsb_2002_2021 in2
 WHERE fatal_injuries > 0
   AND highest_injury_level != 'Fatal'
 ORDER BY 1
```

```
ntsb_number|highest_injury_level|fatal_injuries|
-----------+--------------------+--------------+
ANC09FA001 |                    |             2|
DFW08FA237 |                    |             2|
LAX08FA300 |                    |             1|
MIA08MA203 |                    |             4|
NYC08FA319 |                    |             1|
NYC08FA324 |                    |             1|
NYC08LA322 |                    |             1|
```

Found 7 rows with inconsistent data.

II. `highest_injury_level` and `serious_injuries`

- For each column where `highest_injury_level` equals `Serious` the value of the column `serious_injuries` must be greater than zero:

```
SELECT ntsb_number, highest_injury_level, serious_injuries
  FROM io_ntsb_2002_2021 in2
 WHERE highest_injury_level = 'Serious'
   AND fatal_injuries = 0
   AND serious_injuries = 0
 ORDER BY 1
```

```
ntsb_number|highest_injury_level|serious_injuries|
-----------+--------------------+----------------+
```

No inconsistencies found.

- For each column where `serious_injuries` greater than zero the value of the column `highest_injury_level` must be `Serious`:

```
SELECT ntsb_number, highest_injury_level, serious_injuries
  FROM io_ntsb_2002_2021 in2
```

```
      WHERE fatal_injuries = 0
        AND serious_injuries > 0
        AND highest_injury_level != 'Serious'
      ORDER BY 1
```

```
    ntsb_number|highest_injury_level|serious_injuries|
    -----------+--------------------+---------------+
```

No inconsistencies found.

3.11 intentional_act

```
intentional_act|Accidents All|Accidents Fatal|Fatalities|
---------------+-------------+--------------+----------+
true           |           55|            32|        39|
               |        30186|          5598|     10206|
```

3.12 phase_of_flight

```
phase_of_flight     |Accidents All|Accidents Fatal|Fatalities|
--------------------+-------------+--------------+----------+
                    |        10822|          2135|      4086|
Approach            |         2147|           569|      1089|
Emergency Descent   |          200|            36|        58|
Enroute             |         3150|           906|      1728|
Initial Climb       |         1870|           529|       938|
Landing             |         6112|           101|       141|
Maneuvering         |         2536|           985|      1562|
Post-Impact         |            6|             0|          |
Pushback/Tow        |           24|             0|          |
Standing            |          392|            35|        47|
Takeoff             |         2205|           205|       368|
Taxi                |          569|             6|        10|
Uncontrolled Descent|           42|            24|        44|
Unknown             |          166|            99|       174|
```

3.13 purpose_of_flight

```
purpose_of_flight        |Accidents All|Accidents Fatal|Fatalities|
-------------------------+-------------+--------------+----------+
                         |         1808|           318|       969|
Aerial application       |         1442|           167|       177|
Aerial observation       |          342|            90|       168|
Air drop                 |            8|             2|         3|
```

```
Air race/show            |      147|        63|       81|
Banner tow               |       98|        15|       18|
Business                 |      778|       194|      403|
Executive/Corporate      |      139|        35|      126|
External load            |      109|        25|       30|
Ferry                    |      160|        42|      211|
Firefighting             |       28|         9|       14|
Flight test              |      338|        69|       99|
Glider tow               |       53|        15|       20|
Instructional            |     4030|       374|      675|
Other work use           |      502|        92|      180|
Personal                 |    18909|      3826|     6538|
Positioning              |      688|       156|      262|
Public aircraft          |      152|        28|       43|
Public aircraft - federal|       94|        18|       33|
Public aircraft - local  |       74|         9|       13|
Public aircraft - state  |       61|        12|       23|
Skydiving                |      128|        19|       52|
Unknown                  |      153|        52|      107|
```

3.14 `serious_injuries`

```
serious_injuries|Accidents All|Accidents Fatal|Fatalities|
----------------+-------------+---------------+----------+
              0|          736|            169|       288|
              1|         3288|            553|       866|
              2|          758|            112|       210|
              3|          149|             50|        88|
              4|           53|             17|        44|
              5|           13|              6|        14|
              6|            6|              2|         6|
              7|            5|              1|         5|
              8|            1|              1|         1|
              9|            3|              3|        16|
             66|            1|              1|        11|
               |        25228|           4715|      8696|
```

Without duplication of events caused by involved aircraft, i.e. only including events with the value '1' in the column `aircraft_number`:

```
serious_injuries|Accidents All|Accidents Fatal|Fatalities|
----------------+-------------+---------------+----------+
              0|          729|            169|       288|
              1|         3258|            536|       838|
              2|          753|            111|       208|
              3|          147|             49|        87|
              4|           53|             17|        44|
              5|           13|              6|        14|
              6|            6|              2|         6|
```

```
       7|            5|            1|            5|
       8|            1|            1|            1|
       9|            2|            2|           10|
      66|            1|            1|           11|
        |        24919|         4635|         8338|
```

4.Attempt to derive the aggregated work sheets from the detailed data

The number of data rows in Worksheet 29 in the MS Excel file is 30,241 (row #4 to row #30,244 inclusive), and summing the columns `Fatal Injuries` (I) and `Serious Injuries` (J) gives 10,245 and 5,700 respectively. These numbers can be confirmed with the following query in the database table `io_ntsb_2002_2021`:

5. Legacy stuff

Worksheet no. 29 obviously contains the detailed events underlying the statistics in the previous worksheets. Now, in order to make the data in the **IO-AVSTATS-DB** database comparable to this MS Excel file, the data from Worksheet no. 29 was loaded into the **IO-AVSTATS-DB** database as database table `io_ntsb_2002_2021`, unchanged.

Totals

From Table 10

```
accidents_all|accidents_fatal|fatalities_total|fatalities_aboard|
-------------+---------------+----------------+-----------------+
       28255|           5291|            9248|             8991|
```

Total

```
SELECT count(*)                                   accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                        fatalities_total
  FROM io_ntsb_2002_2021 in2
```

```
accidents_all|accidents_fatal|fatalities_total|
-------------+---------------+----------------+
       30241|           5630|           10245|
```

```
SELECT count(*)                                   accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                        fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
```

```
accidents_all|accidents_fatal|fatalities_total|
-------------+--------------+----------------+
        29887|          5530|            9850|
```

```sql
SELECT count(*)                               accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                    fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE country = 'United States'
```

```
accidents_all|accidents_fatal|fatalities_total|
-------------+--------------+----------------+
        29697|          5357|            9453|
```

```sql
SELECT count(*)                               accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                    fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
   AND country IN ('Bahamas', 'United States')
```

```
accidents_all|accidents_fatal|fatalities_total|
-------------+--------------+----------------+
        29347|          5261|            9217|
```

```sql
SELECT country,
       count(*)                               accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                    fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
 GROUP BY country
 ORDER BY 3 DESC
```

```sql
SELECT aircraft_number,
       count(*)                               accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
```

```
        sum(fatal_injuries)                          fatalities_total
  FROM io_ntsb_2002_2021 in2
 GROUP BY aircraft_number
 ORDER BY 1```
```

aircraft_number|accidents_all|accidents_fatal_hil|accidents_fatal_fi|fatalities_total| --------------+------------+-
----------------+-----------------+----------------+ 1| 29887| 5523| 5530| 9850| 2| 347| 97| 97| 388| 3| 6| 2| 2|
6| 4| 1| 1| 1| 1|

```sql
SELECT country,
       count(*)                                    accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                         fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
   AND country = 'United States'
 GROUP BY country
 ORDER BY 1
```

```
country
|accidents_all|accidents_fatal_hil|accidents_fatal_fi|fatalities_total|
-------------+------------+-----------------+----------------+--------------
-+
United States|        29347|             5254|            5261|
9217|
```

Total by Country

```
SELECT country,
       count(*)                                    accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                         fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
 GROUP BY country
 ORDER BY 3 DESC
```

```
country                        |accidents_all|accidents_fatal|fatalities_total|
-------------------------------+------------+--------------+--------------+
United States                  |        29347|           5261|           9217|
Mexico                         |           48|             33|             70|
```

```
Bahamas                      |        57|        30|        82|
Canada                       |        44|        23|        43|
France                       |        38|        22|        55|
Germany                      |        28|        15|        29|
United Kingdom               |        28|        13|        28|
Dominican Republic           |        17|        12|        25|
Guatemala                    |        11|         7|        13|
Italy                        |        15|         7|         8|
Spain                        |         9|         6|        15|
Colombia                     |        11|         6|        12|
                             |        13|         5|        11|
Costa Rica                   |         6|         4|        16|
Iceland                      |         5|         4|         6|
Switzerland                  |         7|         4|         6|
Austria                      |         6|         4|        10|
Brazil                       |         8|         4|        11|
Honduras                     |         4|         3|        12|
Venezuela                    |         9|         3|         7|
...
```

Total by Flight Regulation

```
SELECT flight_regulation ,
       count(*)                                 accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                      fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
 GROUP BY flight_regulation
 ORDER BY 3 DESC
```

```
flight_regulation            |accidents_all|accidents_fatal|fatalities_total|
-----------------------------+-------------+---------------+----------------+
Part 91: General aviation    |        25981|           4840|            8309|
Part 135: Air taxi & commuter |        1033|            227|             595|
Non-U.S., non-commercial     |          286|            169|             390|
Part 137: Agricultural       |         1427|            152|             158|
Public aircraft              |          345|             68|             122|
Part 133: Rotorcraft ext. load|         151|             36|              42|
Part 121: Air carrier        |          620|             20|             180|
Unknown                      |           26|             15|              49|
Part 125: 20+ pax,6000+ lbs  |            9|              3|               5|
Part 91 subpart k: Fractional |           8|              0|               0|
Armed Forces                 |            1|              0|                |
```

```sql
SELECT flight_regulation ,
       count(*)                                 accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                      fatalities_total
  FROM io_ntsb_2002_2021 in2
GROUP BY flight_regulation
ORDER BY 3 DESC
```

```
flight_regulation          |accidents_all|accidents_fatal|fatalities_total|
---------------------------+-------------+---------------+----------------+
Part 91: General aviation  |        26256|           4925|            8665|
Part 135: Air taxi & commuter |      1054|            233|             621|
Non-U.S., non-commercial   |          288|            171|             394|
Part 137: Agricultural     |         1442|            157|             164|
Public aircraft            |          349|             70|             125|
Part 133: Rotorcraft ext. load|        151|             36|              42|
Part 121: Air carrier      |          657|             20|             180|
Unknown                    |           26|             15|              49|
Part 125: 20+ pax,6000+ lbs |           9|              3|               5|
Part 91 subpart k: Fractional |          8|              0|               0|
Armed Forces               |            1|              0|                |
```

Total by Flight Schedule Type

```sql
SELECT flight_schedule_type  ,
       count(*)                                 accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                      fatalities_total
  FROM io_ntsb_2002_2021 in2
WHERE aircraft_number = 1
GROUP BY flight_schedule_type
ORDER BY 3 DESC
```

```
flight_schedule_type|accidents_all|accidents_fatal|fatalities_total|
--------------------+-------------+---------------+----------------+
                    |        27976|           5226|            8981|
Non-scheduled       |         1269|            283|             683|
Scheduled           |          642|             21|             186|
```

Total by Purpose of Flight

```sql
SELECT purpose_of_flight  ,
       count(*)                                 accidents_all,
```

```
           count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
           sum(fatal_injuries)                         fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
 GROUP BY purpose_of_flight
 ORDER BY 3 DESC
```

```
purpose_of_flight         |accidents_all|accidents_fatal|fatalities_total|
--------------------------+-------------+---------------+----------------+
Personal                  |        18744|           3776|            6422|
Instructional             |         3971|            360|             636|
                          |         1749|            311|             942|
Business                  |          770|            192|             399|
Aerial application        |         1427|            162|             171|
Positioning               |          679|            153|             258|
Aerial observation        |          340|             89|             160|
Other work use            |          494|             87|             162|
Flight test               |          338|             69|              99|
Air race/show             |          130|             55|              70|
Unknown                   |          153|             52|             107|
Ferry                     |          158|             40|              56|
Executive/Corporate       |          139|             35|             126|
Public aircraft           |          151|             28|              43|
External load             |          109|             25|              30|
Skydiving                 |          125|             19|              52|
Public aircraft - federal |           94|             18|              33|
Banner tow                |           98|             15|              18|
Glider tow                |           49|             13|              15|
Public aircraft - state   |           61|             12|              23|
Public aircraft - local   |           73|              9|              13|
Firefighting              |           27|              8|              12|
Air drop                  |            8|              2|               3|
```

Total by Intentional Act

```
SELECT intentional_act   ,
       count(*)                                    accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                         fatalities_total
  FROM io_ntsb_2002_2021 in2
 WHERE aircraft_number = 1
 GROUP BY intentional_act
 ORDER BY 3 DESC```
```

intentional_act|accidents_all|accidents_fatal|fatalities_total| ---------------+-------------+--------------+--------
--------+ | 29832| 5498| 9811| true | 55| 32| 39|

Total by Defining Event

```sql
SELECT defining_event  ,
       count(*)                                    accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                         fatalities_total
 FROM io_ntsb_2002_2021 in2
WHERE aircraft_number = 1
GROUP BY defining_event
ORDER BY 3 DESC
```

```
defining_event
|accidents_all|accidents_fatal|fatalities_total|
-----------------------------------+------------+--------------+-------------
--+
                                   |       10746|          2101|
3857|
Loss of Control In-Flight          |        3402|          1486|
2625|
System/Component Failure - Powerplant|      3169|           335|
504|
Controlled Flight Into Terrain     |         527|           294|
588|
Unknown                            |         284|           189|
323|
Unintended Flight Into IMC         |         249|           173|
317|
Other                              |         954|           170|
273|
System/Component Failure - Non-power |       885|           139|
247|
Fuel Related                       |        1137|           135|
204|
Low Altitude Operation             |         341|           116|
166|
Midair                             |         111|            58|
152|
Abrupt Maneuver                    |         136|            55|
105|
Collision on Takeoff or Landing    |         478|            46|
102|
Loss of Control on Ground          |        2921|            35|
53|
Abnormal Runway Contact            |        2522|            34|
43|
Windshear/Thunderstorm             |          76|            23|
47|
Fire - Non-Impact                  |         135|            21|
```

```
                                                             40|
Ground Handling                     |                119|                18|
24|
Turbulence Encounter                |                205|                16|
22|
Medical Event                       |                 14|                11|
12|
Runway Excursion                    |                442|                11|
28|
Icing                               |                 24|                10|
15|
Loss of Lift                        |                137|                 9|
19|
Bird Strike                         |                128|                 9|
28|
Security Related                    |                 11|                 7|
8|
External Load                       |                 22|                 7|
8|
Ground Collision                    |                273|                 5|
12|
Navigation Error                    |                 13|                 3|
4|
Runway Incursion - Vehicle          |                 13|                 3|
5|
Undershoot/Overshoot                |                252|                 3|
9|
Simulated/training event            |                 11|                 2|
3|
Glider Towing                       |                 14|                 2|
2|
Cabin Safety Events                 |                 54|                 2|
2|
Aerodrome                           |                 19|                 1|
1|
Air Traffic Management              |                  2|                 1|
2|
Wildlife Encounter                  |                 58|                 0|
0|
Fire - Post-Impact                  |                  1|                 0|
  |
Evacuation                          |                  2|                 0|
  |
```

Total by Phase of Flight

```
SELECT phase_of_flight ,
       count(*)                                   accidents_all,
       count(*) FILTER (WHERE fatal_injuries > 0) accidents_fatal,
       sum(fatal_injuries)                        fatalities_total
  FROM io_ntsb_2002_2021 in2
```

```
WHERE aircraft_number = 1
GROUP BY phase_of_flight
ORDER BY 3 DESC
```

```
phase_of_flight       |accidents_all|accidents_fatal|fatalities_total|
--------------------+-------------+---------------+----------------+
                    |        10698|           2094|            3846|
Maneuvering         |         2500|            964|            1518|
Enroute             |         3118|            885|            1665|
Approach            |         2121|            558|            1052|
Initial Climb       |         1861|            527|             934|
Takeoff             |         2202|            205|             368|
Unknown             |          166|             99|             174|
Landing             |         6089|             98|             137|
Emergency Descent   |          200|             36|              58|
Standing            |          347|             35|              47|
Uncontrolled Descent|           42|             24|              44|
Taxi                |          516|              5|               7|
Post-Impact         |            6|              0|                |
Pushback/Tow        |           21|              0|                |
```

Observation 1 - Fatalities

Observation: Discrepancy between `Fatal Injuries` and `Highest Injury Level`:

```
SELECT ev_year                                              "Year",
       count(*) FILTER (WHERE highest_injury_level = 'Fatal') "Accidents Fatal 1",
       count(*) FILTER (WHERE fatal_injuries > 0)          "Accidents Fatal 2"
FROM io_ntsb_2002_2021
GROUP BY ev_year
HAVING count(*) FILTER (WHERE highest_injury_level = 'Fatal') != count(*) FILTER
(WHERE fatal_injuries > 0)
ORDER BY ev_year
```

```
Year|Accidents Fatal 1|Accidents Fatal 2|
----+-----------------+-----------------+
2008|              298|              305|
```

Events affected - Table 29:

```
SELECT ntsb_number, event_date, fatal_injuries, highest_injury_level
FROM io_ntsb_2002_2021
WHERE fatal_injuries > 0
  AND highest_injury_level != 'Fatal'
```

```
ntsb_number|event_date           |fatal_injuries|highest_injury_level|
-----------+---------------------+--------------+--------------------+
ANC09FA001 |2008-10-01 00:00:00.000|             2|                    |
DFW08FA237 |2008-09-28 00:00:00.000|             2|                    |
LAX08FA300 |2008-09-28 00:00:00.000|             1|                    |
MIA08MA203 |2008-09-27 00:00:00.000|             4|                    |
NYC08FA319 |2008-09-23 00:00:00.000|             1|                    |
NYC08FA324 |2008-09-26 00:00:00.000|             1|                    |
NYC08LA322 |2008-09-23 00:00:00.000|             1|                    |
```

This problem does not occur in the IO-AVSTATS-DB database!

```
SELECT ntsb_no, ev_year, inj_f_grnd, inj_tot_f, ev_highest_injury
FROM io_app_ae1982 iaa
WHERE (inj_f_grnd > 0 OR inj_tot_f > 0)
  AND ev_highest_injury != 'FATL'
ORDER BY ntsb_no
```

```
ntsb_no|ev_year|inj_f_grnd|inj_tot_f|ev_highest_injury|
-------+-------+----------+---------+-----------------+
```

The corrupted data in the MS Excel file looks correct in the IO-AVSTATS-DB database:

```
SELECT ntsb_no, ev_year, inj_f_grnd, inj_tot_f, ev_highest_injury
FROM io_app_ae1982 iaa
WHERE ntsb_no
        IN ('NYC08FA319',
            'NYC08LA322',
            'NYC08FA324',
            'MIA08MA203',
            'DFW08FA237',
            'LAX08FA300',
            'ANC09FA001')
ORDER BY ntsb_no
```

```
ntsb_no   |ev_year|inj_f_grnd|inj_tot_f|ev_highest_injury|
----------+-------+----------+---------+-----------------+
ANC09FA001|   2008|         0|        2|FATL             |
DFW08FA237|   2008|         0|        2|FATL             |
LAX08FA300|   2008|         0|        1|FATL             |
MIA08MA203|   2008|         0|        4|FATL             |
```

```
NYC08FA319|    2008|          0|          1|FATL             |
NYC08FA324|    2008|          0|          1|FATL             |
NYC08LA322|    2008|          0|          1|FATL             |
```

Conclusion: The `Highest Injury Level` column in the MS Excel file cannot be used to determine fatalities!

Observation 2 - Incidents

Observation: If the worksheet no. 29+ also contains events of type `INC` (incident):

```sql
SELECT ntsb_number, event_date
FROM io_ntsb_2002_2021
WHERE ntsb_number IN (SELECT ntsb_no FROM io_app_ae1982 WHERE ev_type = 'INC')
```

```
ntsb_number|event_date|
-----------+----------+
```

Conclusion: Worksheet no. 29 does not contain any events of type `INC`!

Observation 3 - Duplicates 1

Observation: Are more than 1 line included for the same `NTSB Number`:

```sql
SELECT count(ntsb_number)
FROM (SELECT count(*), ntsb_number
      FROM io_ntsb_2002_2021 in2
      GROUP BY ntsb_number
      HAVING count(*) > 1) g
```

```
count|
-----+
  336|
```

```sql
SELECT ntsb_number, event_date, state_or_region, city, country, fatal_injuries
FROM io_ntsb_2002_2021 in3
WHERE ntsb_number in (SELECT ntsb_number
                      FROM io_ntsb_2002_2021 in2
                      GROUP BY ntsb_number
                      HAVING count(*) > 1)
ORDER BY ntsb_number
```

```
ntsb_number|event_date             |state_or_region    |city
|country       |fatal_injuries|
-----------+--------------------+-------------------+-----------------------
--+-------------+-------------+
ANC02LA053 |2002-06-19 00:00:00.000|Alaska            |Ketchikan
|United States|             |
ANC02LA053 |2002-06-19 00:00:00.000|Alaska            |Ketchikan
|United States|             |
ANC02LA086 |2002-07-30 00:00:00.000|Alaska            |Fairbanks
|United States|             |
ANC02LA086 |2002-07-30 00:00:00.000|Alaska            |Fairbanks
|United States|             |
ANC02LA098 |2002-08-19 00:00:00.000|Alaska            |Ketchikan
|United States|             |
ANC02LA098 |2002-08-19 00:00:00.000|Alaska            |Ketchikan
|United States|             |
ANC03LA005 |2002-10-22 00:00:00.000|Alaska            |BETHEL
|United States|             |
ANC03LA005 |2002-10-22 00:00:00.000|Alaska            |BETHEL
|United States|             |
ANC04FA016 |2003-12-28 00:00:00.000|Arizona           |Peoria
|United States|            4|
ANC04FA016 |2003-12-28 00:00:00.000|Arizona           |Peoria
|United States|            4|
ANC06FA048 |2006-04-23 00:00:00.000|Alaska            |Chugiak
|United States|            5|
ANC06FA048 |2006-04-23 00:00:00.000|Alaska            |Chugiak
|United States|            5|
ANC08LA106 |2008-08-18 00:00:00.000|Alaska            |Bethel
|United States|             |
ANC08LA106 |2008-08-18 00:00:00.000|Alaska            |Bethel
|United States|             |
ANC09LA004 |2008-10-07 00:00:00.000|Alaska            |Bethel
|United States|             |
ANC09LA004 |2008-10-07 00:00:00.000|Alaska            |Bethel
|United States|             |
ANC09LA011 |2008-11-14 00:00:00.000|Alaska            |Fairbanks
|United States|             |
ANC09LA011 |2008-11-14 00:00:00.000|Alaska            |Fairbanks
|United States|             |
ANC10LA094 |2010-09-15 00:00:00.000|Alaska            |Dillingham
|United States|             |
ANC10LA094 |2010-09-15 00:00:00.000|Alaska            |Dillingham
|United States|             |
ANC11FA062 |2011-07-10 00:00:00.000|Alaska            |Port Alsworth
|United States|             |
ANC11FA062 |2011-07-10 00:00:00.000|Alaska            |Port Alsworth
|United States|             |
```

Conclusion: There are 336 events with more than 1 line included in worksheet 29.

Observation 4 - Duplicates 2

Observation: How many lines are there in the events with multiple lines:

```
SELECT count(*), ntsb_number, ev_year
FROM io_ntsb_2002_2021 in2
GROUP BY ntsb_number, ev_year
HAVING count(*) > 1
ORDER BY 1 desc
```

```
count|ntsb_number|ev_year|
-----+-----------+-------+
    3|CEN10FA115 |   2010|
    2|ERA11CA296 |   2011|
    2|WPR12CA163 |   2012|
    2|MIA04FA043 |   2004|
    2|LAX08FA265 |   2008|
    2|NYC07LA209 |   2007|
    2|ERA09TA466 |   2009|
    2|GAA19CA346 |   2019|
    2|SEA07FA264 |   2007|
    2|DCA15CA012 |   2014|
    2|ANC02LA086 |   2002|
```

Conclusion: Only in 2010 there is an event with 3 lines, otherwise there are always 2 lines.

2.Worksheet no. 10 vs. no. 29

Worksheet no. 10{:target="_blank"}

Observation 1 - Completeness

Observation: Are all events from worksheet 29 included in worksheet 10:

```
SELECT ev_year                                      "Year",
       count(*)                                     "Accidents All",
       count(*) FILTER (WHERE fatal_injuries > 0) "Accidents Fatal",
       sum(fatal_injuries)                          "Fatalities"
FROM io_ntsb_2002_2021
GROUP BY ev_year
ORDER BY ev_year
```

```
Year|Accidents All|Accidents Fatal|Fatalities|
----+-------------+---------------+----------+
2002|         1837|            367|       624|
2003|         1890|            381|       723|
2004|         1735|            346|       648|
2005|         1804|            340|       613|
2006|         1626|            326|       787|
2007|         1765|            308|       551|
2008|         1688|            305|       593|
2009|         1572|            285|       559|
2010|         1527|            284|       491|
2011|         1578|            293|       510|
2012|         1556|            285|       456|
2013|         1306|            238|       436|
2014|         1302|            268|       451|
2015|         1296|            239|       411|
2016|         1355|            228|       427|
2017|         1331|            212|       349|
2018|         1366|            234|       402|
2019|         1322|            255|       467|
2020|         1152|            215|       369|
2021|         1233|            221|       378|
```

Conclusion: Worksheet no. 29 always contains more events than are included in Worksheet no. 10!

Year	Table 10 Acc. All	Acc. Fatal	Fatal. Total	Fatal. Aboard	Table 29 Acc. All	Acc. Fatal	Fatalities	Table 10 - Table 29 Acc. All	Acc. Fatal	Fatal. Total	Fatal. Aboard
2002	1'716	345	581	575	1'837	367	624	-121	-22	-43	-49
2003	1'741	352	633	630	1'890	381	723	-149	-29	-90	-93
2004	1'619	314	559	559	1'735	346	648	-116	-32	-89	-89
2005	1'671	321	563	558	1'804	340	613	-133	-19	-50	-55
2006	1'523	308	706	547	1'626	326	787	-103	-18	-81	-240
2007	1'654	288	496	491	1'765	308	551	-111	-20	-55	-60
2008	1'569	277	496	487	1'688	305	593	-119	-28	-97	-106
2009	1'481	276	481	472	1'572	285	559	-91	-9	-78	-87
2010	1'441	271	458	455	1'527	284	491	-86	-13	-33	-36
2011	1'471	270	458	447	1'578	293	510	-107	-23	-52	-63
2012	1'471	273	438	438	1'556	285	456	-85	-12	-18	-18
2013	1'223	221	390	386	1'306	238	436	-83	-17	-46	-50
2014	1'222	255	422	412	1'302	268	451	-80	-13	-29	-39
2015	1'211	230	378	375	1'296	239	411	-85	-9	-33	-36
2016	1'269	213	386	379	1'355	228	427	-86	-15	-41	-48
2017	1'234	203	331	331	1'331	212	349	-97	-9	-18	-18
2018	1'275	224	379	376	1'366	234	402	-91	-10	-23	-26
2019	1'221	235	417	409	1'322	255	467	-101	-20	-50	-58
2020	1'086	205	332	323	1'152	215	369	-66	-10	-37	-46
2021	1'157	210	344	341	1'233	221	378	-76	-11	-34	-37

Observation 2 - Duplicates

Observation: Look for reasons for the discrepancies:

```
SELECT ev_year                                      "Year",
       count(*)                                      "Accidents All",
       count(*) FILTER (WHERE fatal_injuries > 0) "Accidents Fatal",
```

```
          sum(fatal_injuries)                        "Fatalities"
   FROM io_ntsb_2002_2021
   WHERE ntsb_number IN (SELECT ntsb_number
                         FROM io_ntsb_2002_2021 in2
                         GROUP BY ntsb_number
                         HAVING count(*) > 1)
   GROUP BY ev_year
   ORDER BY ev_year
```

```
Year|Accidents All|Accidents Fatal|Fatalities|
----+-------------+---------------+----------+
2002|           30|              8|        16|
2003|           42|             16|        48|
2004|           32|             14|        22|
2005|           46|             12|        24|
2006|           30|             10|        26|
2007|           38|             10|        22|
2008|           56|             12|        50|
2009|           28|             12|        36|
2010|           39|             11|        25|
2011|           42|             14|        22|
2012|           32|              8|        12|
2013|           20|              6|        14|
2014|           24|             10|        18|
2015|           30|              2|        10|
2016|           38|             14|        38|
2017|           28|              2|         4|
2018|           38|              6|        14|
2019|           40|             10|        24|
2020|           24|             10|        40|
2021|           16|              2|         4|
```

Conclusion: The ominous existence of duplicates unfortunately does not explain the difference between worksheets no. 10 and no. 29.

3.Worksheet no. 10 vs. IO-AVSTATS

Observation 1 - Completeness

Last checked on January 14, 2023

Observation: Are all events from worksheet 10 included in IO-AVSTATS-DB:

```
SELECT ev_year                                "Year",
       count(*)                               "Accidents All",
       count(*) FILTER (WHERE fatal_injuries > 0) "Accidents Fatal",
       sum(fatal_injuries)                    "Fatalities"
FROM io_ntsb_2002_2021
```

```
where ntsb_number in (select ntsb_no from io_app_ae1982 where ev_type = 'ACC' and
has_us_impact is true)
GROUP BY ev_year
ORDER BY ev_year
```

```
Year|Accidents All|Accidents Fatal|Fatalities|
----+------------+--------------+----------+
2002|        1836|           366|       619|
2003|        1889|           380|       720|
2004|        1734|           346|       648|
2005|        1802|           340|       613|
2006|        1623|           324|       785|
2007|        1762|           307|       549|
2008|        1687|           305|       593|
2009|        1572|           285|       559|
2010|        1527|           284|       491|
2011|        1578|           293|       510|
2012|        1555|           285|       456|
2013|        1305|           237|       435|
2014|        1302|           268|       451|
2015|        1296|           239|       411|
2016|        1355|           228|       427|
2017|        1331|           212|       349|
2018|        1366|           234|       402|
2019|        1322|           255|       467|
2020|        1151|           215|       369|
2021|        1226|           219|       372|
```

```
SELECT ev_year                            "Year",
       count(*)                           "Accidents All",
       count(*) FILTER (WHERE inj_tot_f > 0) "Accidents Fatal",
       sum(inj_tot_f)                     "Fatalities"
FROM io_app_ae1982 iaa
where ev_year >= 2002
  AND ev_year <= 2021
  AND ev_type = 'ACC'
  and has_us_impact is true
GROUP BY ev_year
ORDER BY ev_year
```

```
Year|Accidents All|Accidents Fatal|Fatalities|
----+------------+--------------+----------+
2002|        1851|           369|       621|
2003|        1908|           386|       722|
2004|        1755|           354|       665|
2005|        1809|           348|       623|
2006|        1639|           333|       797|
```

```
2007|         1775|         314|      574|
2008|         1699|         318|      710|
2009|         1635|         325|      903|
2010|         1593|         316|     1137|
2011|         1649|         336|      762|
2012|         1631|         325|      718|
2013|         1377|         281|      570|
2014|         1353|         296|      861|
2015|         1369|         280|      648|
2016|         1438|         272|      661|
2017|         1424|         279|      494|
2018|         1496|         309|      827|
2019|         1410|         313|      800|
2020|         1222|         249|      597|
2021|         1253|         227|      388|
```

```sql
select iaa.ev_id,
       iaa.ntsb_no,
       iaa.ev_year,
       iaa.country,
       iaa.city,
       iaa.inj_tot_f,
       iaa.dprt_countries,
       iaa.dest_countries,
       iaa.regis_countries,
       iaa.owner_countries,
       iaa.oper_countries
FROM io_app_ae1982 iaa
         LEFT OUTER JOIN io_ntsb_2002_2021 in2 ON (iaa.ntsb_no = in2.ntsb_number)
WHERE iaa.ev_year = 2010
  AND in2.ntsb_number IS NULL
  AND iaa.has_us_impact IS TRUE
  AND iaa.ev_type = 'ACC'
ORDER BY iaa.ev_id desc
```

```
ev_id          |ntsb_no    |ev_year|country|city
|inj_tot_f|dprt_countries|dest_countries|regis_countries|owner_countries|oper_coun
tries|
-------------+----------+-------+-------+---------------------------+--------
+-------------+-------------+--------------+--------------+-------------+
20111108X10934|DCA11WA114|   2010|KE     |Vipingo Ridge              |
1|{}           |{}           |{NON-US}      |{USA}         |{USA}        |
20110406X32218|CEN11WA269|   2010|CA     |Pickle Lake, Ontario       |
0|{CA}         |{CA}         |{NON-US}      |{USA}         |{USA}        |
20110113X24716|ENG10RA063|   2010|HK     |Hong Kong                  |
0|{HK}         |{CH}         |{NON-US}      |{HK}          |{USA}        |
20110107X43553|CEN11WA145|   2010|CS     |Bataan                     |
0|{}           |{}           |{NON-US}      |{USA}         |{USA}        |
20101217X95411|DCA11WA013|   2010|MZ     |Maputo                     |
```

```
0|{}              |{}             |{}            |{USA}        |{MZ}        |
20101213X72824|CEN11WA107|  2010|UK       |Finningley                     |
0|{UK}            |{UK}           |{NON-US}     |{USA}        |{USA}       |
20101213X65626|CEN11WA105|  2010|FR       |Tourrettes-sur-Loup            |
2|{FR}            |{FR}           |{NON-US}     |{USA}        |{USA}       |
20101213X14827|ERA11WA086|  2010|CI       |Taltal                         |
1|{CI}            |{CI}           |{NON-US}     |{USA}        |{CI}        |
20101206X53337|CEN11WA096|  2010|SP       |Alcora                         |
0|{}              |{}             |{NON-US}     |{USA}        |{USA}       |
20101206X04031|CEN11WA094|  2010|SW       |Linköping                      |
1|{SW}            |{SW}           |{NON-US}     |{USA}        |{USA}       |
20101130X61641|ERA11WA075|  2010|BR       |Tapurah City                   |
1|{BR}            |{BR}           |{NON-US}     |{USA}        |{USA}       |
20101126X14552|ERA11WA073|  2010|PE       |Andahuayias                    |
0|{PE}            |{PE}           |{NON-US}     |{USA}        |{PE}        |
20101125X11507|WPR11FA059|  2010|USA      |Hollister                      |
1|{USA}           |{USA}          |{NON-US}     |{USA}        |{AS}        |
20101123X92602|CEN11WA080|  2010|PL       |Sekowice                       |
2|{GE}            |{GE}           |{NON-US}     |{USA}        |{USA}       |
20101122X00226|ERA11WA068|  2010|PE       |Huanuco                        |
0|{PE}            |{PE}           |{USA}        |{USA}        |{PE}        |
20101116X32303|DCA11WA008|  2010|PK       |Karachi                        |
21|{PK}           |{USA}          |{NON-US}     |{PK}         |{PK}        |
20101116X12908|WPR11LA049|  2010|USA      |Marana                         |
0|{USA}           |{USA}          |{NON-US}     |{CA}         |{CA}        |
20101115X31938|CEN11WA070|  2010|MX       |Minatitlan Veracruz            |
8|{USA}           |{USA}          |{NON-US}     |{USA}        |{USA}       |
20101110X42226|WPR11WA043|  2010|AS       |Rolleston, Australia           |
1|{AS}            |{AS}           |{NON-US}     |{USA}        |{USA}       |
20101108X91241|CEN11CA059|  2010|USA      |Breakenridge                   |
0|{USA}           |{USA}          |{NON-US}     |{CA}         |{CA}        |
20101031X30917|ERA11LA044|  2010|USA      |Fort Lauderdale                |
0|{CA}            |{USA}          |{NON-US}     |{CA}         |{CA}        |
20101025X42125|WPR11CA028|  2010|USA      |Wells                          |
0|{USA}           |{USA}          |{NON-US}     |{CA}         |{CA}        |
20101020X41300|WPR11WA020|  2010|AS       |Durham Downs, Australia         |
2|{}              |{}             |{NON-US}     |{USA}        |{USA}       |
20101012X13907|CEN11WA013|  2010|MX       |Veracruz                       |
0|{}              |{}             |{NON-US}     |{USA}        |{USA}       |
20101004X40949|ENG10WA057|  2010|RS       |Izhma                          |
0|{USA}           |{USA}          |{NON-US}     |{USA}        |{USA}       |
20101004X24052|DCA11WA002|  2010|UK       |Bristol                        |
0|{MX}            |{UK}           |{NON-US}     |{USA}        |{UK}        |
20101001X32228|ENG10RA056|  2010|AF       |Shakar Darah District          |
0|{USA}           |{USA}          |{NON-US}     |{USA}        |{USA}       |
20100930X30111|DCA10WA101|  2010|VE       |Cuidad Guayana                 |
0|{VE}            |{USA}          |{NON-US}     |{USA}        |{VE}        |
20100929X01447|CEN10WA574|  2010|MX       |Tuxtlas                        |
2|{}              |{}             |{NON-US}     |{USA}        |{USA}       |
20100928X21707|CEN10CA570|  2010|USA      |Sarcoxie                       |
0|{USA}           |{USA}          |{NON-US}     |{USA}        |{USA}       |
20100919X72723|ERA10LA488|  2010|USA      |Halifax                        |
1|{USA}           |{USA}          |{NON-US}     |{USA}        |{USA}       |
20100919X42634|WPR10WA460|  2010|AS       |Geraldton Aerodrome, Australia|
```

```
1|{USA}          |{USA}          |{NON-US}        |{AU}           |{AU}           |
20100918X12923|CEN10WA546|   2010|HO     |San Pedro Sula               |
1|{}             |{}             |{NON-US}        |{USA}          |{USA}          |
20100916X85029|CEN10CA541|   2010|USA    |Mineola                      |
0|{USA}          |{USA}          |{NON-US}        |{USA}          |{USA}          |
20100914X01342|CEN10WA538|   2010|UK     |Ryde                         |
2|{UK,UK}        |{UK,UK}        |{NON-US,NON-US}|{UK,USA}        |{UK,USA}       |
20100912X75605|CEN10WA534|   2010|GP     |Pointe a Pitre               |
0|{GP}           |{USA}          |{NON-US}        |{USA}          |{USA}          |
20100901X85159|CEN10RA511|   2010|CS     |San Jose                     |
0|{}             |{}             |{NON-US}        |{USA}          |{USA}          |
20100901X65026|DCA10WA091|   2010|UK     |London                       |
0|{NO}           |{UK}           |{NON-US}        |{USA}          |{USA}          |
20100901X11325|WPR10WA443|   2010|PP     |Bugoiya                      |
4|{PP}           |{PP}           |{NON-US}        |{USA}          |{PP}           |
20100901X01739|DCA10FA090|   2010|USA    |Dulles                       |
0|{UK}           |{USA}          |{NON-US}        |{UK}           |{USA}          |
20100825X10814|DCA10WA087|   2010|CH     |Yichun                       |
42|{CH}          |{CH}           |{NON-US}        |{USA}          |{USA}          |
20100817X40515|ERA10WA430|   2010|AR     |Mercedes                     |
0|{AR}           |{AR}           |{NON-US}        |{USA}          |{USA}          |
20100803X33417|DCA10WA081|   2010|PK     |Islamabad                    |
157|{PK}         |{PK}           |{NON-US}        |{USA}          |{PK}           |
20100730X85358|DCA10WA080|   2010|GV     |Conakry                      |
0|{}             |{}             |{}             |{USA}          |{MR}           |
20100721X34052|DCA10RA079|   2010|SA     |Riyadh                       |
0|{}             |{}             |{NON-US}        |{USA}          |{USA}          |
20100714X03542|DCA10WA074|   2010|SP     |Girona                       |
0|{SP}           |{UK}           |{NON-US}        |{USA}          |{USA}          |
20100708X84328|CEN10WA374|   2010|MX     |Piedras Negras               |
8|{}             |{}             |{NON-US}        |{USA}          |{USA}          |
20100630X72411|ERA10WA340|   2010|CI     |San Felipe                   |
0|{CI}           |{CI}           |{NON-US}        |{USA}          |{USA}          |
20100627X20107|CEN10RA345|   2010|MX     |Campeche                     |
0|{USA}          |{USA}          |{NON-US}        |{USA}          |{USA}          |
20100624X50945|WPR10WA309|   2010|AS     |Broken Hill                  |
1|{AS}           |{AS}           |{NON-US}        |{AS}           |{USA}          |
20100623X13907|DCA10WA070|   2010|CF     |Dima                         |
11|{}            |{}             |{}             |{USA}          |{CF}           |
20100621X12612|CEN10WA331|   2010|NO     |Sirdal                       |
0|{NO}           |{USA}          |{NON-US}        |{USA}          |{USA}          |
20100615X95126|DCA10WA068|   2010|SF     |Johannesburg                 |
0|{}             |{}             |{NON-US}        |{USA}          |{SF}           |
20100614X12305|CEN10RA319|   2010|MX     |Felipe Carrillo Puerto       |
9|{MX}           |{USA}          |{NON-US}        |{MX}           |{MX}           |
20100603X92434|CEN10WA293|   2010|GE     |Bielefeld                    |
4|{}             |{}             |{NON-US}        |{USA}          |{USA}          |
20100603X85900|CEN10WA292|   2010|FI     |Emäsalo                      |
1|{}             |{}             |{NON-US}        |{FI}           |{USA}          |
20100522X50538|DCA10RA063|   2010|IN     |Manglaore                    |
158|{}           |{}             |{NON-US}        |{USA}          |{IN}           |
20100521X23753|WPR10WA249|   2010|AS     |Traralgon, Australia         |
1|{AS}           |{AS}           |{NON-US}        |{AS}           |{USA}          |
20100519X65147|ERA10WA272|   2010|BR     |Manaus                       |
```

```
6|{BR}           |{BR}            |{NON-US}       |{USA}           |{BR}        |
20100519X44533|WPR10WA245|  2010|RP      |Lucena City, Philippines      |
4|{RP}           |{RP}            |{NON-US}       |{RP}            |{USA}       |
20100516X61819|ERA10LA267|  2010|USA     |Clearwater                    |
0|{USA}          |{HA}            |{NON-US}       |{MX}            |{MX}        |
20100512X53621|DCA10RA059|  2010|LY      |Tripoli                       |
103|{}             |{}              |{NON-US}       |{USA}           |{USA}        |
20100511X23826|CEN10WA248|  2010|UK      |Old Buckenham                 |
1|{GE}           |{USA}           |{NON-US}       |{USA}           |{USA}       |
20100511X03836|DCA10WA057|  2010|CO      |Mitu                          |
0|{CO}           |{CO}            |{NON-US}       |{CO}            |{USA}       |
20100503X31325|CEN10LA234|  2010|USA     |Haysville                     |
1|{USA}          |{USA}           |{NON-US}       |{USA}           |{USA}       |
20100503X01600|ERA10WA252|  2010|BR      |Resende                       |
2|{BR}           |{BR}            |{NON-US}       |{USA}           |{BR}        |
20100429X00503|ENG10RA025|  2010|RS      |Smolensk                      |
89|{PL}           |{RS}            |{NON-US}       |{USA}           |{USA}        |
20100428X20315|CEN10CA229|  2010|USA     |Amarillo                      |
0|{USA}          |{USA}           |{NON-US}       |{USA}           |{USA}       |
20100414X92635|DCA10RA053|  2010|MX      |Monterrey                     |
5|{MX}           |{MX}            |{NON-US}       |{USA}           |{USA}       |
20100414X90838|DCA10WA051|  2010|ID      |Manokwari                     |
0|{ID}           |{ID}            |{NON-US}       |{USA}           |{ID}        |
20100414X53531|CEN10WA205|  2010|GT      |Guatemala City                |
0|{}             |{}              |{NON-US}       |{USA}           |{USA}       |
20100414X14446|ENG10RA022|  2010|AS      |Darwin Aerodrome              |
2|{}             |{}              |{NON-US}       |{USA}           |{USA}       |
20100413X85237|ERA10WA226|  2010|IT      |Vigne                         |
3|{IT}           |{AU}            |{NON-US}       |{USA}           |{USA}       |
20100412X43956|DCA10WA050|  2010|WA      |Wlotzkasbaken                 |
1|{}             |{}              |{}             |{USA}           |{USA}       |
20100412X21857|DCA10WA049|  2010|FR      |Paris                         |
0|{HK}           |{FR}            |{NON-US}       |{USA}           |{USA}       |
20100409X22252|WPR10RA197|  2010|MY      |Kota Bahru                    |
0|{MY}           |{MY}            |{NON-US}       |{USA}           |{USA}       |
20100405X44344|DCA10WA045|  2010|CF      |Kinshasa                      |
0|{}             |{}              |{}             |{CF}            |{USA}       |
20100323X54139|WPR10LA174|  2010|USA     |Hollister                     |
0|{USA}          |{USA}           |{NON-US}       |{AS}            |{AS}        |
20100312X94247|CEN10WA153|  2010|FR      |Chambery                      |
1|{FR}           |{FR}            |{NON-US}       |{SZ}            |{USA}       |
20100305X54655|DCA10WA036|  2010|TW      |Taipai                        |
0|{USA}          |{TW}            |{NON-US}       |{TW}            |{TW}        |
20100203X01641|CEN10WA112|  2010|NL      |Schiphol                      |
0|{}             |{}              |{NON-US}       |{USA}           |{USA}       |
20100129X92638|DCA10WA025|  2010|LU      |Luxembourg                    |
0|{SP}           |{LU}            |{NON-US}       |{USA}           |{USA}       |
20100119X95202|ERA10LA119|  2010|USA     |Palmetto                      |
1|{USA}          |{USA}           |{NON-US}       |{USA}           |{USA}       |
20100118X42210|WPR10WA114|  2010|PW      |Palau International Airport    |
0|{USA}          |{USA}           |{NON-US}       |{USA}           |{USA}       |
20100111X10557|CEN10LA093|  2010|USA     |Eagle                         |
0|{USA}          |{MX}            |{NON-US}       |{MX}            |{MX}        |
```

Conclusion: IO-AVSTATS-DB always contains more events than are included in Worksheet no. 10!

Year	NTSB 2002 - 2021 Acc All	Acc Fat	Fatalities	IO-AVSTATS-DB Acc All	Acc Fat	Fatalities	Difference Acc All	Acc Fat	Fatalities
2002	1'836	366	619	1'851	369	621	−15	−3	−2
2003	1'889	380	720	1'908	386	722	−19	−6	−2
2004	1'734	346	648	1'755	354	665	−21	−8	−17
2005	1'802	340	613	1'809	348	623	−7	−8	−10
2006	1'623	324	785	1'639	333	797	−16	−9	−12
2007	1'762	307	549	1'775	314	574	−13	−7	−25
2008	1'687	305	593	1'699	318	710	−12	−13	−117
2009	1'572	285	559	1'635	325	903	−63	−40	−344
2010	1'527	284	491	1'593	316	1'137	−66	−32	−646
2011	1'578	293	510	1'649	336	762	−71	−43	−252
2012	1'555	285	456	1'631	325	718	−76	−40	−262
2013	1'305	237	435	1'377	281	570	−72	−44	−135
2014	1'302	268	451	1'353	296	861	−51	−28	−410
2015	1'296	239	411	1'369	280	648	−73	−41	−237
2016	1'355	228	427	1'438	272	661	−83	−44	−234
2017	1'331	212	349	1'424	279	494	−93	−67	−145
2018	1'366	234	402	1'496	309	827	−130	−75	−425
2019	1'322	255	467	1'410	313	800	−88	−58	−333
2020	1'151	215	369	1'222	249	597	−71	−34	−228
2021	1'226	219	372	1'253	227	388	−27	−8	−16

4.Worksheet no. 29 vs. IO-AVSTATS

Observation 1 - Missing in IO-AVSTATS

Observation: Are all events of worksheet no. 29 contained in IO-AVSTATS:

```
SELECT ntsb_number, ev_year, city, state_or_region, country, fatal_injuries
FROM io_ntsb_2002_2021 in3
WHERE ntsb_number NOT IN (SELECT ntsb_no FROM events)
ORDER BY ev_year, ntsb_number
```

```
ntsb_number|ev_year|city     |state_or_region|country      |fatal_injuries|
-----------+-------+--------+---------------+------------+--------------+
CEN21LA236 |   2021|Longmont|Colorado        |United States|              |
```

Conclusion: This minimal difference can certainly be explained by a subsequent correction.

Observation 2 - Missing in Worksheet

Observation: Are all events of IO-AVSTATS contained in worksheet no. 29:

```sql
SELECT ntsb_no, ev_id, ev_year, ev_site_zipcode, ev_city, ev_country, inj_tot_f
FROM events e
WHERE ev_year >= 2002
  AND ev_year <= 2021
  AND ev_type = 'ACC'
  AND ntsb_no NOT IN (SELECT ntsb_number FROM io_ntsb_2002_2021 in2)
ORDER BY ev_year, ev_id
```

```
ntsb_no    |ev_id         |ev_year|ev_site_zipcode|ev_city
|ev_country|inj_tot_f|
----------+--------------+-------+--------------+----------------------------
-----------+----------+---------+
WAS02WA015|20020109X00049|   2002|00000         |Tarapoto
|PE        |         |
MIA02LA054|20020201X00157|   2002|34142         |Immokalee
|USA       |        1|
LAX02LA072|20020201X00161|   2002|92145         |San Diego
|USA       |        2|
WAS02RA017|20020212X00207|   2002|00000         |Ishpingo
|EC        |         |
WAS02WA019|20020220X00235|   2002|00000         |Santa Elena
|VE        |         |
WAS02RA021|20020221X00240|   2002|00000         |CACKCHILA
|GT        |        2|
CHI02WA080|20020225X00253|   2002|              |Libourne
|FR        |        3|
DCA02WA023|20020226X00261|   2002|              |San Juan
|AR        |         |
SEA02LA039|20020228X00289|   2002|97009         |Boring
|USA       |        1|
SEA02LA042|20020228X00290|   2002|98282         |Concrete
|USA       |         |
WAS02WA023|20020301X00296|   2002|              |Indore
|IN        |         |
IAD02WA031|20020302X00298|   2002|              |Zernez
|SZ        |        2|
WAS02WA026|20020306X00311|   2002|00000         |San Antonio
|PE        |        2|
MIA02WA065|20020308X00318|   2002|              |Montevideo
|UY        |         |
WAS02RA025|20020308X00319|   2002|00000         |El Tigre
|CO        |       26|
```

```sql
SELECT count(*), ev_year
FROM (SELECT ntsb_no, ev_id, ev_year, ev_site_zipcode, ev_city, ev_country,
inj_tot_f
    FROM events e
    WHERE ev_year >= 2002
```

```
        AND ev_year <= 2021
        AND ev_type = 'ACC'
        AND ntsb_no NOT IN (SELECT ntsb_number FROM io_ntsb_2002_2021 in2)
    ORDER BY ev_year, ev_id) g
GROUP BY ev_year
ORDER BY ev_year
```

```
count|ev_year|
-----+-------+
  115|   2002|
  128|   2003|
  141|   2004|
  147|   2005|
  141|   2006|
  152|   2007|
  130|   2008|
  124|   2009|
  140|   2010|
  175|   2011|
  177|   2012|
  166|   2013|
  162|   2014|
  206|   2015|
  207|   2016|
  196|   2017|
  218|   2018|
  203|   2019|
  169|   2020|
  291|   2021|
```

Conclusion: 3388 Events of IO-AVSTATS are not included in worksheet no. 29!

Observation 3 - Non-US aircraft registration number

Observation: All events involving only aircraft with missing or non-U.S. registration numbers are missing from Worksheet No. 29.:

```
SELECT ntsb_number,
       event_date,
       city,
       state_or_region,
       country,
       aircraft_number,
       registration_number,
       fatal_injuries
FROM io_ntsb_2002_2021 in2
WHERE ntsb_number IN (SELECT e.ntsb_no
                      FROM events e
```

```
                            INNER JOIN aircraft a ON (e.ev_id = a.ev_id)
                    WHERE ev_year >= 2002
                      AND ev_year <= 2021
                      AND ev_type = 'ACC'
                      AND (a.regis_no IS NULL
                        or upper(a.regis_no) = 'NONE'
                        or a.regis_no NOT LIKE 'N%')
                      AND RTRIM(a.owner_country) != 'USA'
                      AND RTRIM(a.oper_country) != 'USA'
                      AND RTRIM(a.dprt_country) != 'USA'
                      AND RTRIM(a.dest_country) != 'USA')
ORDER BY ev_year, ntsb_number
```

```
ntsb_number|event_date             |city           |state_or_region|country
|aircraft_number|registration_number|fatal_injuries|
-----------+-----------------------+---------------+---------------+----------+---
-----------+-------------------+--------------+
ANC08TA028 |2007-12-20 00:00:00.000|McMurdo Station|               |Antarctica|
1|C-FMKB             |              |
```

```
SELECT e.ev_id,
       a.aircraft_key,
       a.regis_no,
       a.dprt_country,
       a.dest_country,
       a.owner_country,
       a.oper_country
FROM events e
         INNER JOIN aircraft a ON (e.ev_id = a.ev_id)
WHERE e.ev_year >= 2002
  AND e.ev_year <= 2021
  AND a.regis_no LIKE 'N%'
  AND rtrim(a.dest_country) != 'USA'
  AND rtrim(a.dprt_country) != 'USA'
  AND rtrim(a.owner_country) != 'USA'
  AND rtrim(a.oper_country) != 'USA'
```

```
ev_id
|aircraft_key|regis_no|dprt_country|dest_country|owner_country|oper_country|
-------------+------------+--------+------------+------------+------------+-----
-------+
20081202X25642|           1|N400SA  |BR          |BR          |BR          |BR
|
20081230X00408|           1|N104BN  |BP          |BP          |NH          |NH
|
20120327X14319|           1|N27TR   |AR          |AR          |AR          |AR
|
```

20130305X21219|	1|N471M	PP	PP	NH	NH
20140922X90145|	1|N1027G	FR	UK	UK	UK
20150707X14422|	1|N642RM	RS	RS	RS	RS
20150903X44600|	1|N9068F	KR	KR	NH	NH
20151112X63511|	1|N692BE	TU	LY	AS	AS
20160630X91359|	1|N188RU	CO	CO	CO	CO
20170308X31846|	1|N805LA	UN	UN	NH	NH
20170728X93637|	1|N1001R	BR	BR	BR	BR
20180301X63457|	1|N3AD	CA	GL	GE	GE
20180329X93928|	1|N561LC	SZ	UN	UN	UN
20180813X53624|	1|N2451J	DR	DR	DR	DR
20181029X14552|	1|N474CG	GE	SZ	UK	SZ
20190212X72918|	1|N842CD	FR	FR	FR	FR
20190708X33047|	1|N3294P	IC	IC	IC	IC
20190805X10835|	1|N989AE	CO	CO	CB	CO
20200924X51906|	1|N9056K	SA	SA	SA	SA
20061214X01789|	1|N79KD	AU	GE	UK	GE
20090512X15548|	1|N1116G	CO	CO	CO	CO

Conclusion: Only events where either an aircraft with a U.S. registration number (N1 - N99999, N1A - N9999Z, N1AA - N999ZZ) is involved or the U.S. is either the departure country, destination country, owner country or operator country are considered.