Sri Lanka Institute of Information Technology

IT3021-Data Warehousing and Business Intelligence

Spy Plane Finder Data Warehouse Solution

Assignment 2

Document

Submitted By:

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Table of Contents

1. Data source for the assignment-2 3

1.1 Description of the dataset 3

1.1.1 EER diagram for aircraft tracking dataset 3

1.1.2 Diagram for Data Sources Patriating 4

1.1.3 Solution architecture 4

1.2 Description of the data source 4

2. SSAS Cube Implementation 5

2.1. Create an Analysis Services project. 5

2.2. Create new data source 6

2.3. Create new data source View. 6

2.4. Create a cube 8

2.5. Deploy the cube 10

2.6. Create a KPI 12

2.7. Browsing Cube Data 14

3. Demonstration of OLAP operations 15

3.1. Using MDX queries/ POWERPIVOT mode. 15

3.2. Using features available in Data tab. 18

1. Drill- down and Roll-up 18

2. Slice 20

3. Dice 21

4. Pivot 21

Dashboard 24

4. SSRS Reports 25

4.5.1 First, we need to create a Data Source. 25

4.5.2 Next, we need to create a Dataset. 26

4.5.3 Then, Create the visualization in my report. 27

Report 1: Report with a matrix 27

Report 2: Parameterized Report 29

Report 3: SSRS drill-down report 35

Report 4: SSRS drill-through report 36

Level 1- Main report 36

Level 2- Sub report 37

1. Data source for the assignment 2

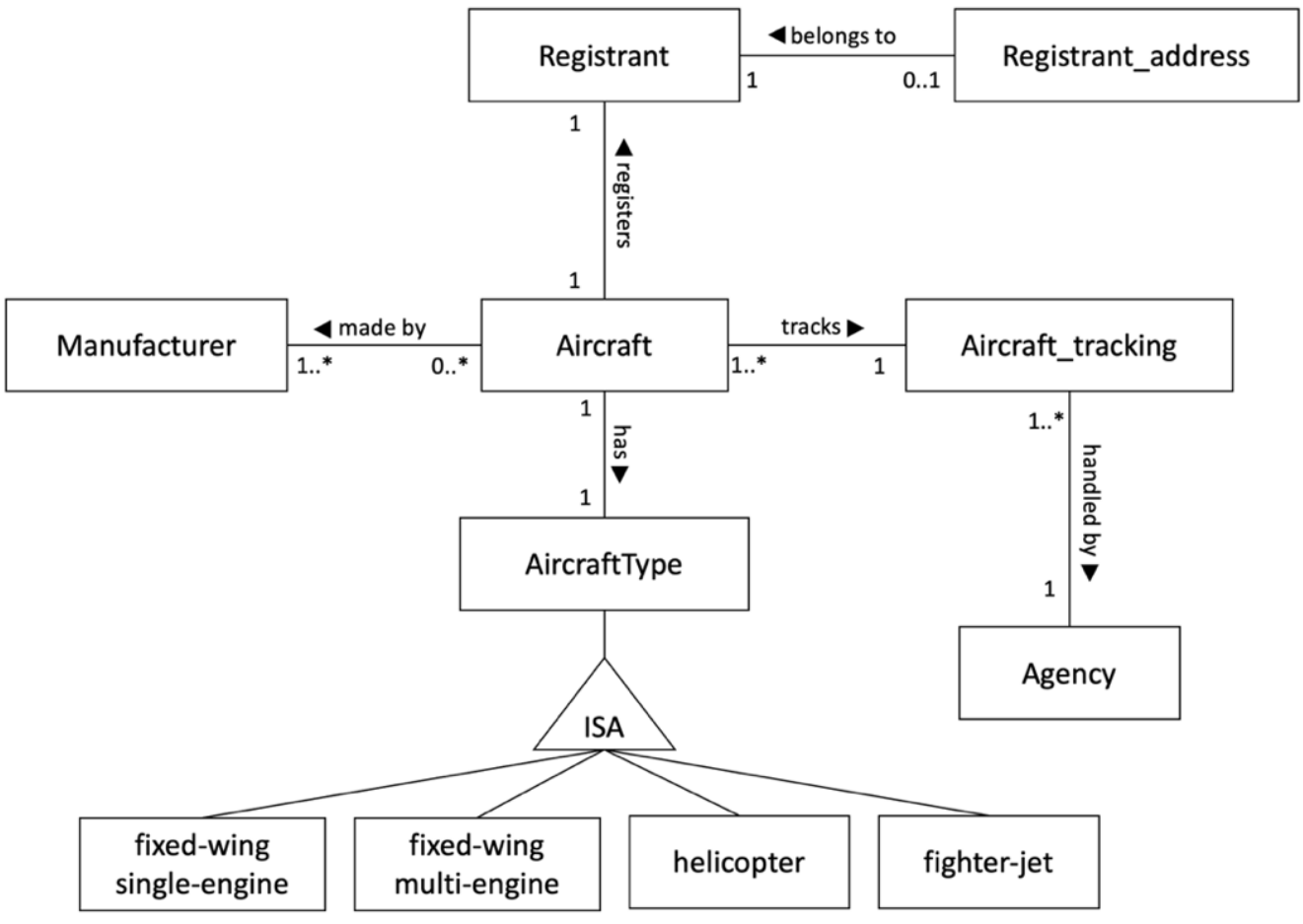
1.1 Description of the dataset

This dataset about flights of spy planes operated by the FBI and the Department of Homeland Security (DHS) which is the data comes from more than four months of plane tracking data provided by the website Flightradar24, plus the Federal Aviation Administration's aircraft registration database. The original source files can be found using the links provided below.

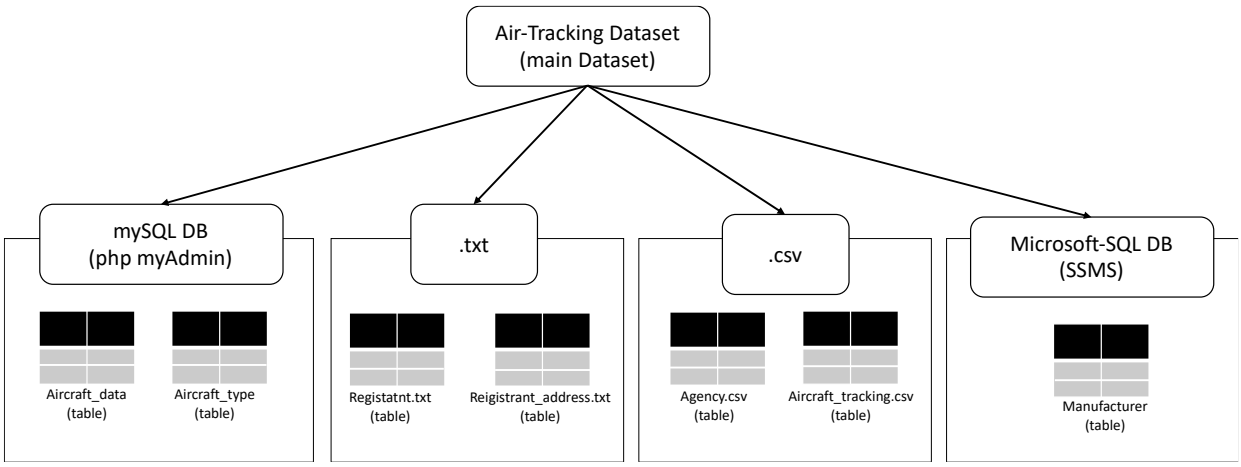
Source Links:

1. https://github.com/BuzzFeedNews/2016-04-federal-surveillance-planes
2. https://www.kaggle.com/jboysen/spy-plane-finder

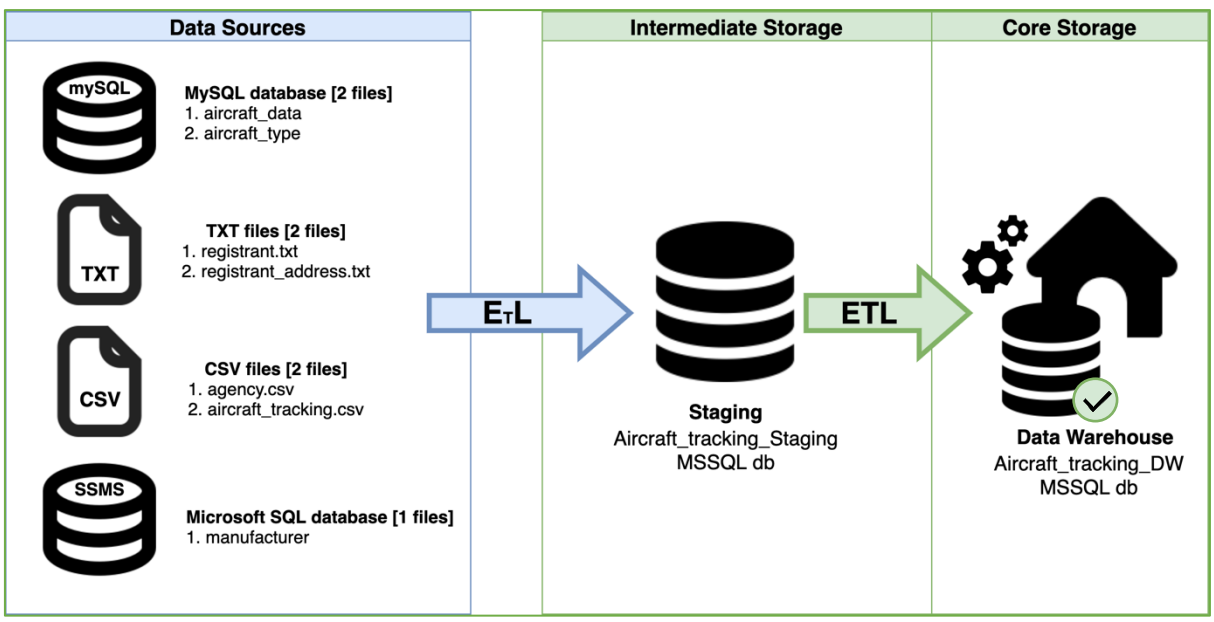
1.1.1 EER diagram for aircraft tracking dataset



1.1.2 Diagram for Data Sources Patriating



1.1.3 Solution architecture



1.2 Description of the data source

In this assignment, Firstly, we will create an OLAP cube using SQL Server Analysis Services; SSAS. For that, we have to use the data warehouse was created in 1st assignment. Before continuing with this assignment-2, You can get the idea of previous SSIS assignment refer to brief description and diagrams given above. We can continue with the data which is available in the data warehouse layer now.

Tools Required:

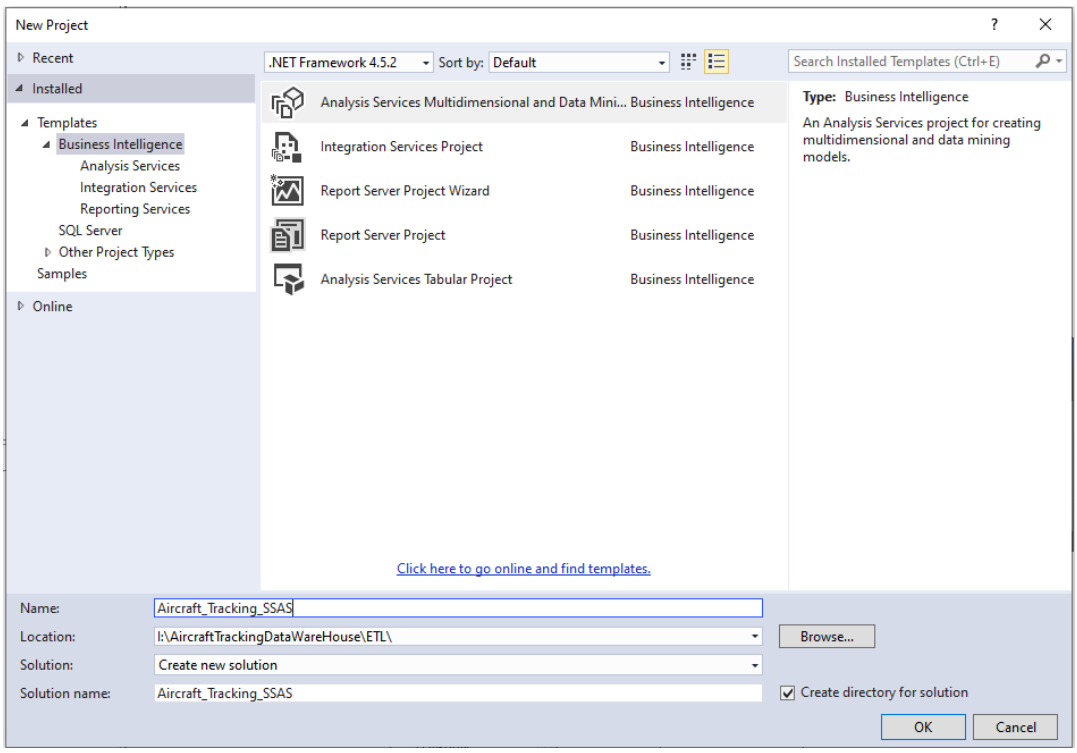
- SQL Server Data Tools or Report Builder
- SQL Server Management Studio
- Microsoft Excel

2. SSAS Cube Implementation

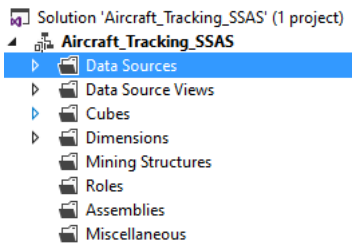
Let's start using data warehouse as the data source and create an SSAS cube. In order to create required Cubes and related components, let's create an SSAS Project using Visual Studio Data Tools.

2.1. Create an Analysis Services project.

First, we have to open Visual Studio Data Tools in 'Administrator' mode. Then, we have to create an Analysis Services project.



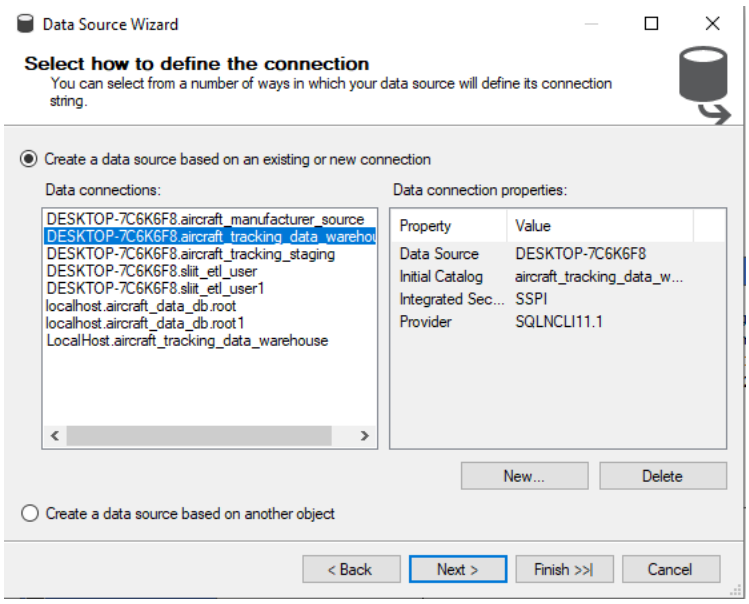
Once the project created you can see a similar folder structure to the image below, in *Solution Explorer*.



We need to configure components above, starting from Data Sources to Dimensions, in order to create a working SSAS Cube.

2.2. Create new data source

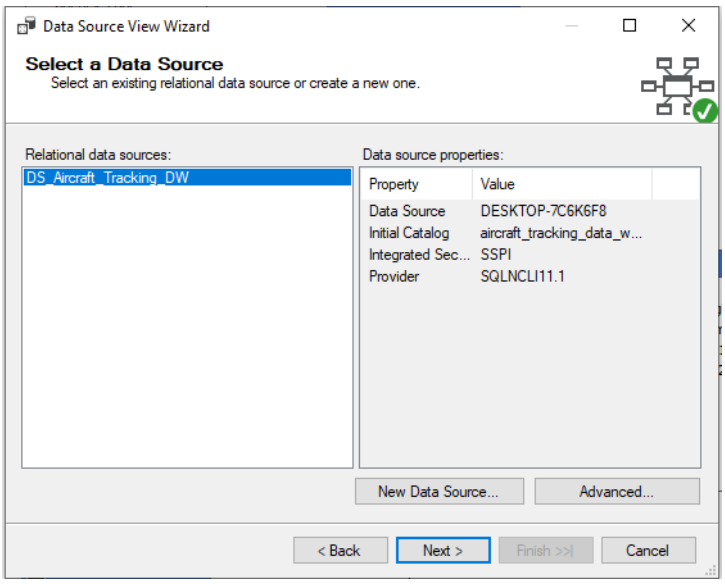
Then, we have to configure a data source. Data source defines from where, the cube is extracting data. To configure, right click on Data Sources and create new data source. Then you can have the data source wizard like the image given below.



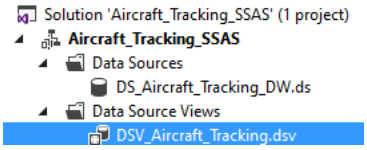
In here we are selecting a connection to the data source, Therefore, 'aircraft_tracking_data_warehouse' as we have already created this connection previously in SSIS projects. However, after following the steps successfully we can see the data source we created under data sources.

2.3. Create new data source View.

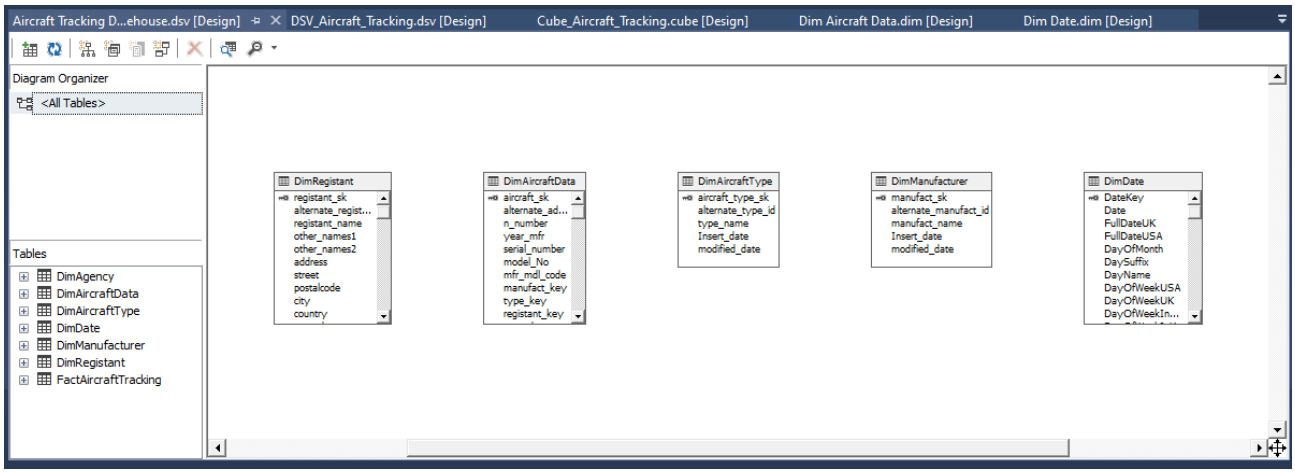
Likewise, we have created the Data sources view as well.



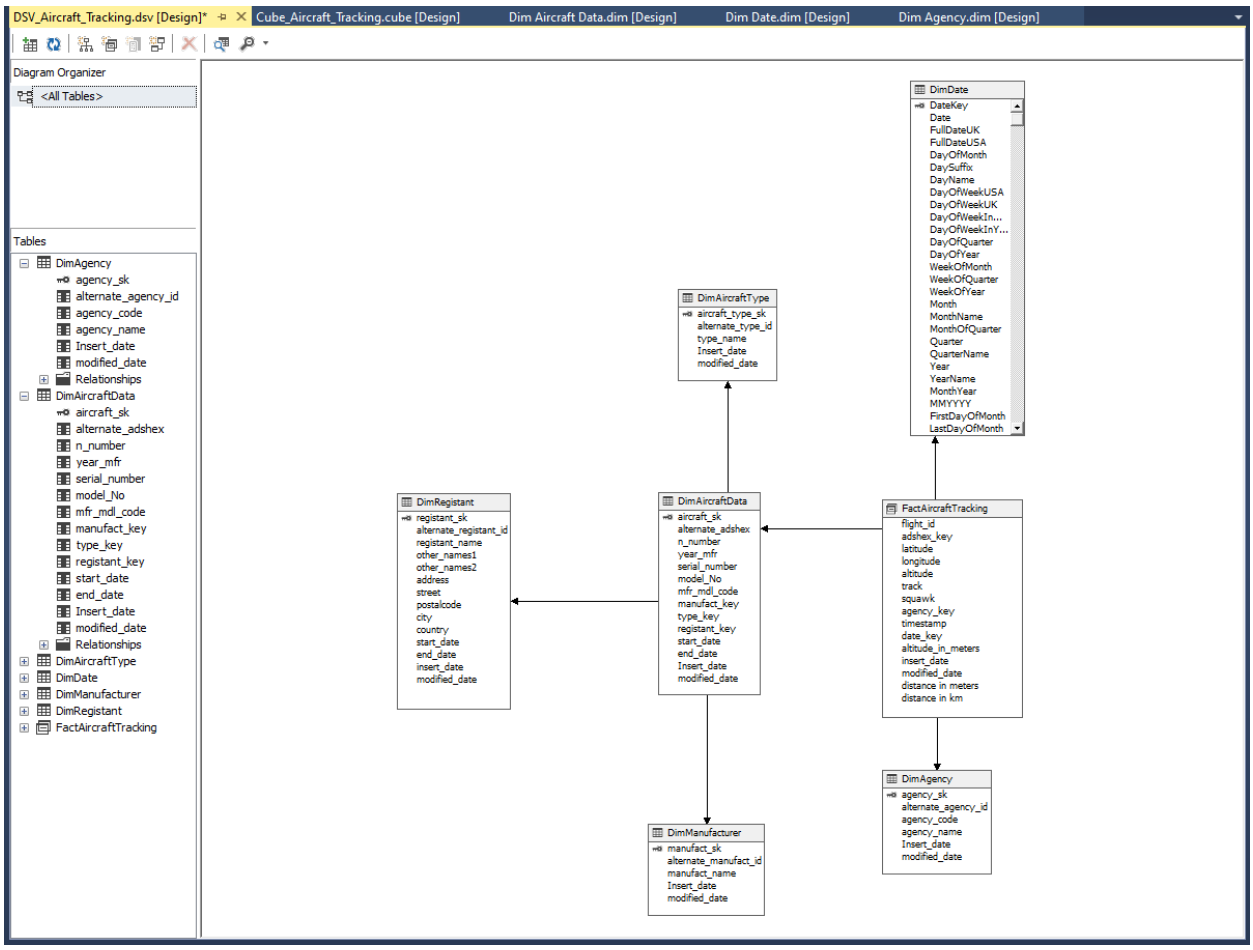
Then you can see created data sources and data source view like the image given below.



After we open the created data source view, you will see that none of the tables are connected in the design view once completed

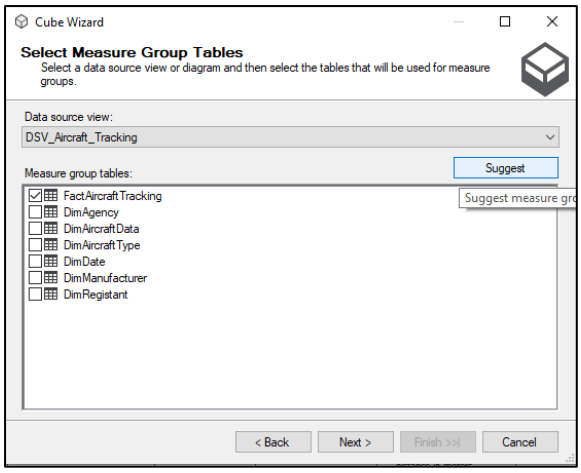


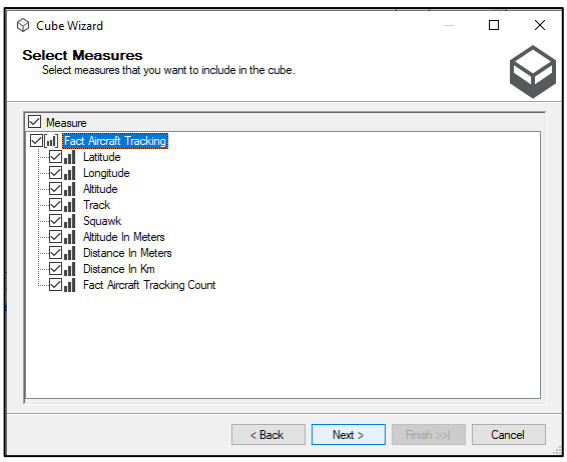
In that case, we have to create table links. To link 'DimAircraftData' and 'FactAircraftTracking' tables, click on 'adshex_key' column of the 'FactAircraftTracking', drag and drop it on the 'aircraft_sk' column of the 'DimAircraftData' table. Similarly using corresponding SK/FKs link, link all the tables.

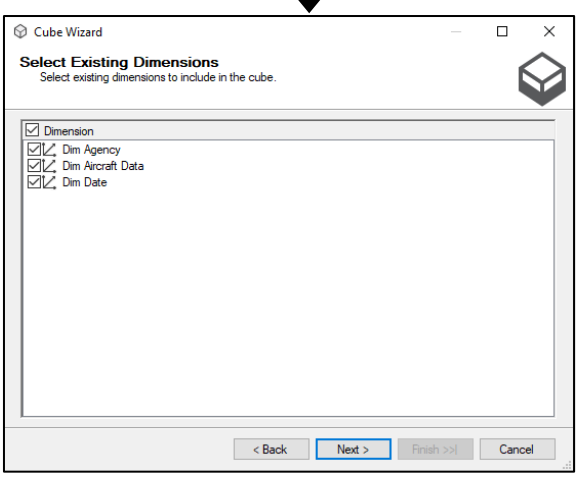


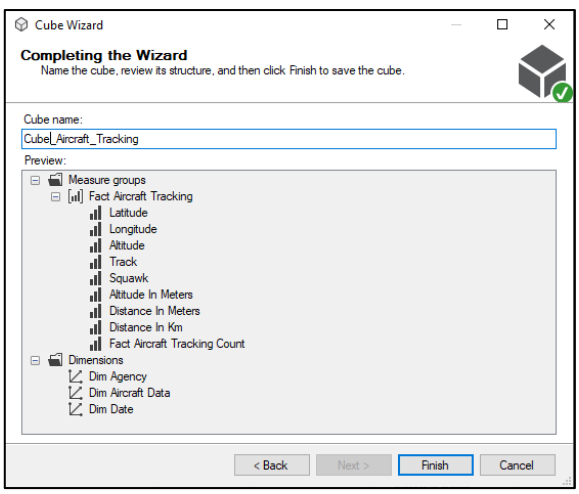
2.4. *Create a cube*

Then we have to create a cube. For that, we can right click on Cubes and create a new cube. Then, cube wizard will be popped up. Then we can complete the wizard as follows.

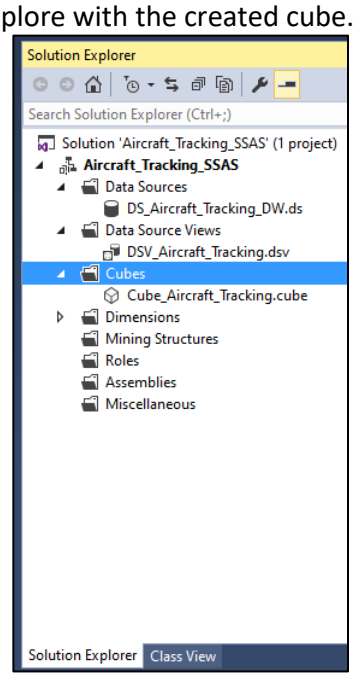




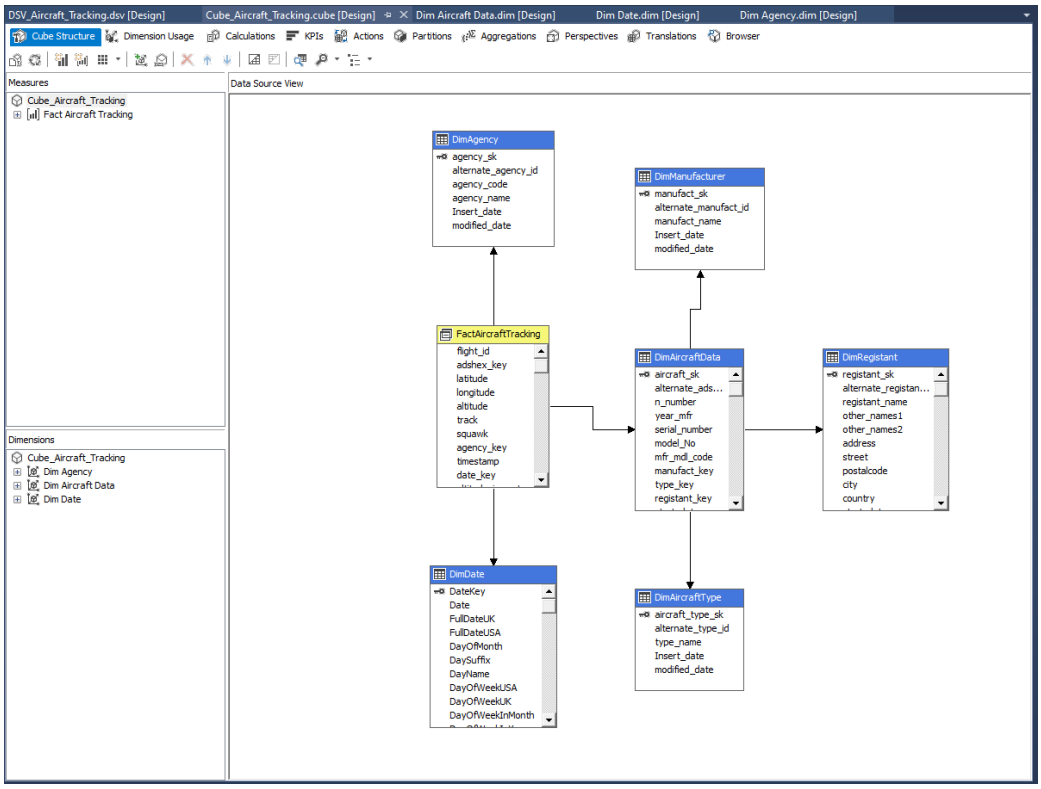




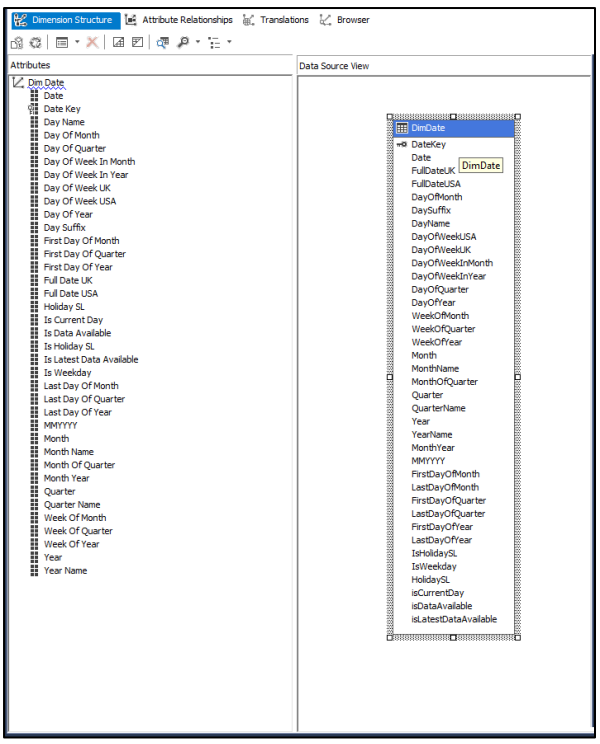
Then, you can see the solution explore with the created cube.

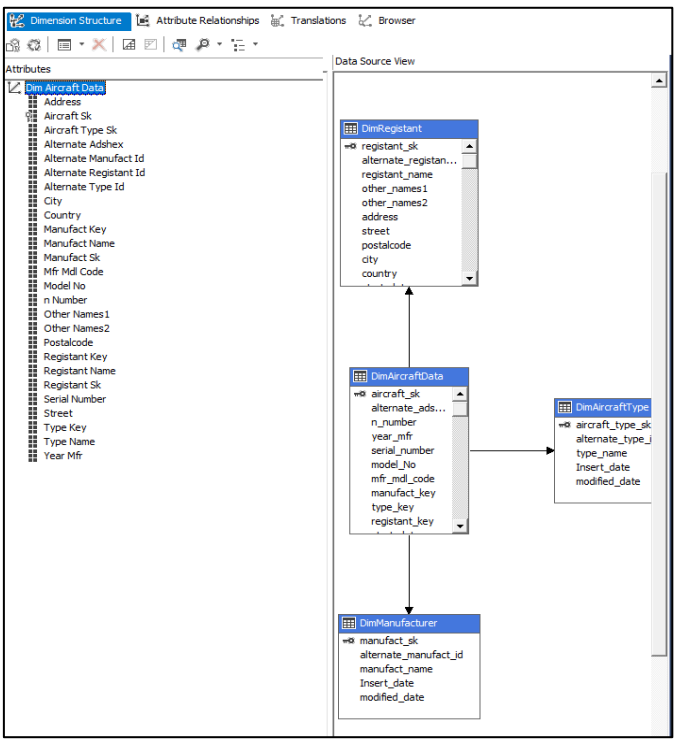


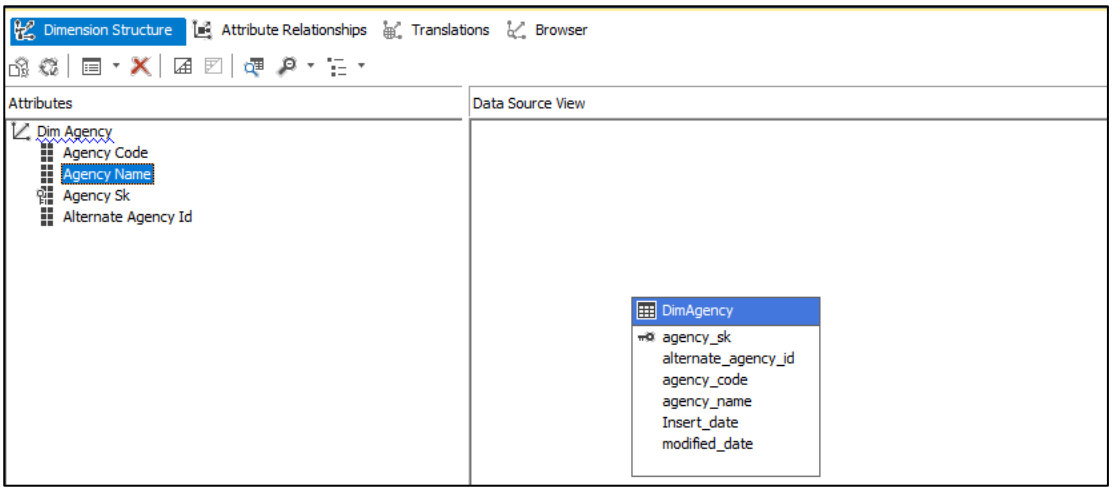
Then you will see the same snowflake schema is built as a cube.



In the Dimensions section, you can only see the dimension tables which are directly linked to the fact table. Then we have to expand those dimensions and check whether other attributes are missing or not. Most of the time attributes only consist with the surrogate keys. Therefore, we have to drag and drop the attributes, but derived attributes have to be avoided in this point. Reason is 'Modified_Date', 'Insert_Date' like reality fields makes no meaning for an analysis.



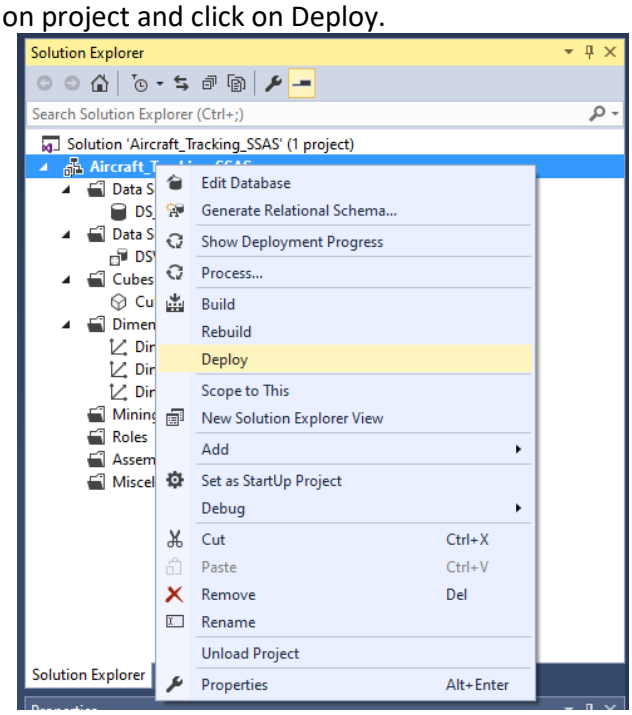




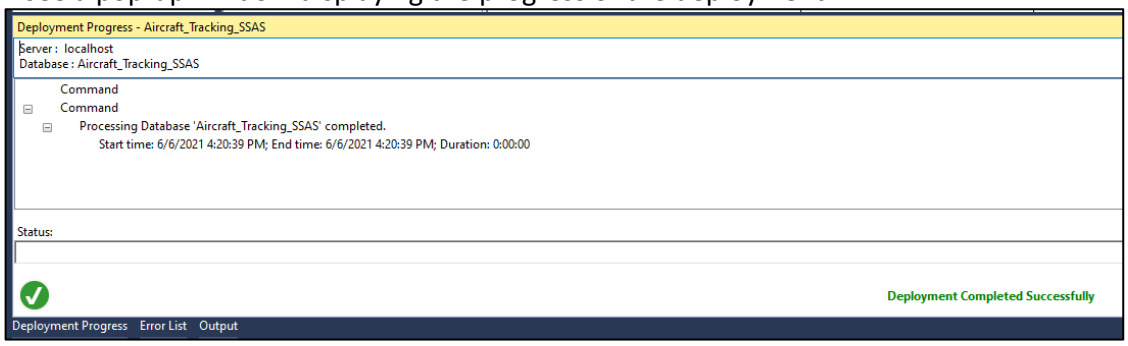
2.5. *Deploy the cube*

After that, we have to deploy the cube. The Cube must be deployed in order to be used for analysis. Having proper connection details provided will take effect in this stage when you try to deploy. Once deployed, SSAS Cube will be available for analysis under SSAS databases accessible via SSMS.

We can right click on project and click on Deploy.

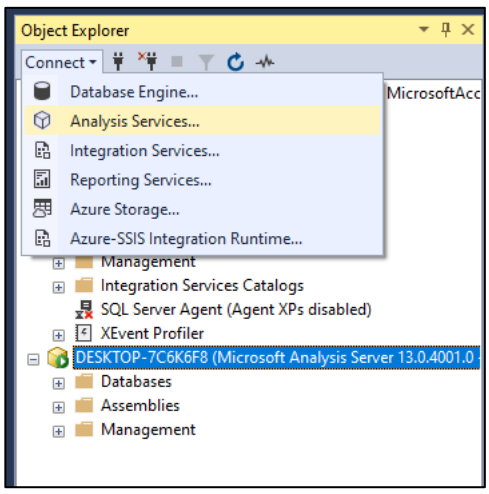


You will see a pop-up window displaying the progress of the deployment

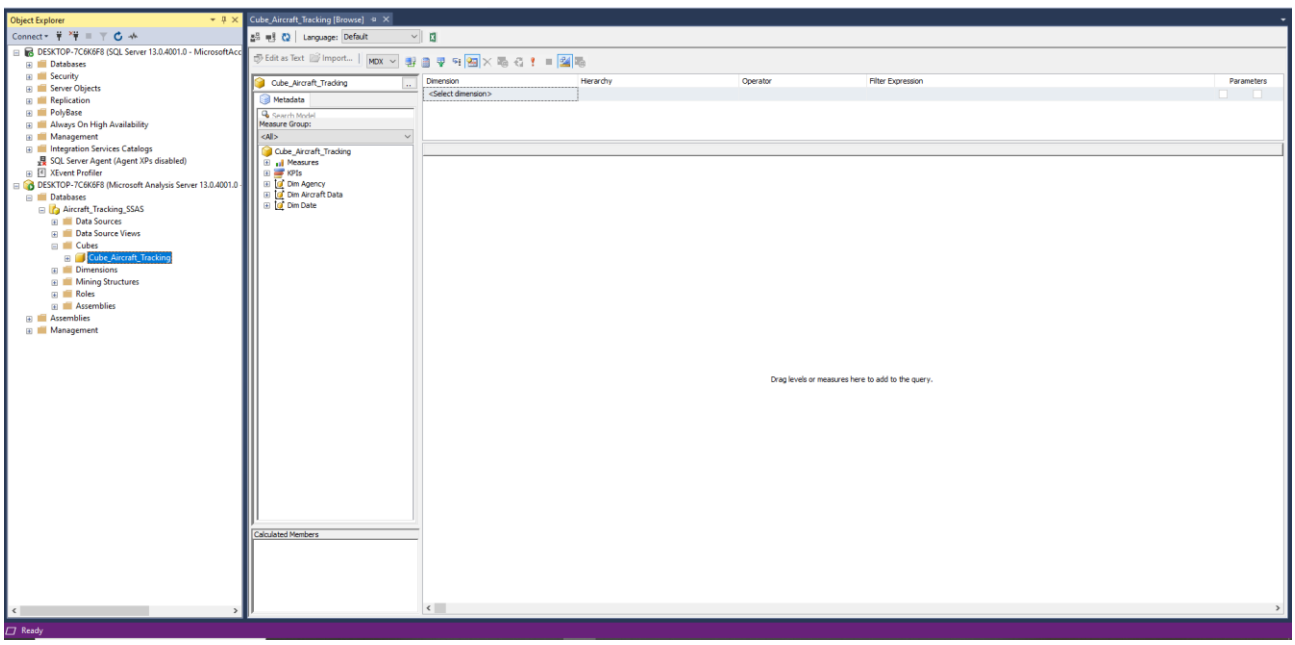


Once successfully deployed, we have to go to Browser tab under 'Cube_Aircraft_Tracking' design window ('Cube_Aircraft_Tracking.cube[Design]'), will have the attributes of the model on the left hand side, where you can drag and drop the into the design area on the right-hand side and do some test analysis.

We have to open the SQL Server Management Studio for continue the other steps. Then like the image given below, we have to select Analysis Services…



There we can open the databases → Cubes → Cube_Aircraft_Tracking → right click→ Browse. Then we can see the surface like the image given below.

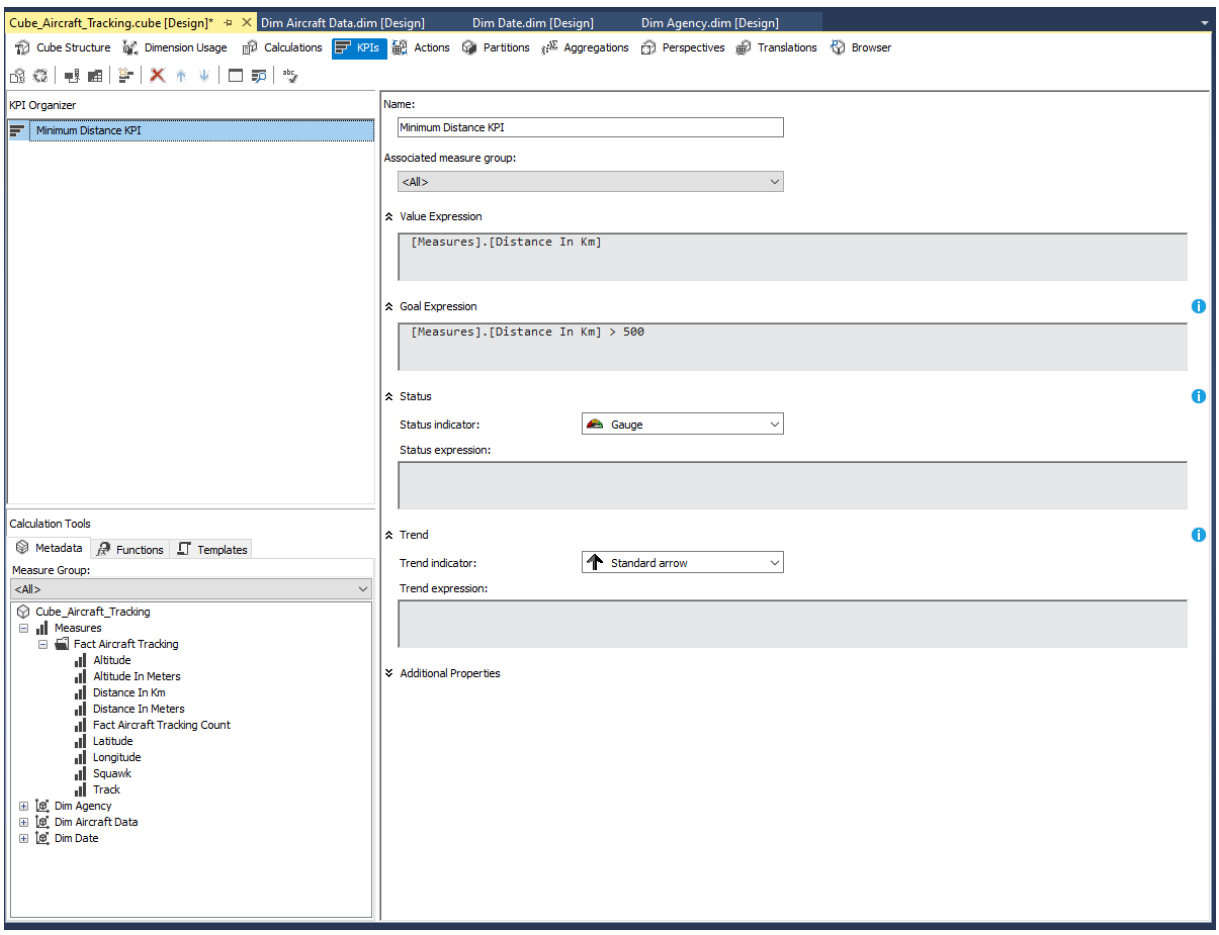


Its look like the same browser window you saw in Data Tools in 'Cube_Aircraft_Tracking' design window ('Cube_Aircraft_Tracking.cube[Design]') should appear here allowing you to analyse data. Optionally you can write MDX, DAX queries there.

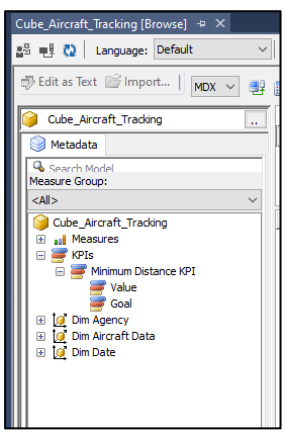
2.6. *Create a KPI*

Then we can create a KPI which are created based on the business requirements. KPIs depend on what the organization want to monitor and measure.

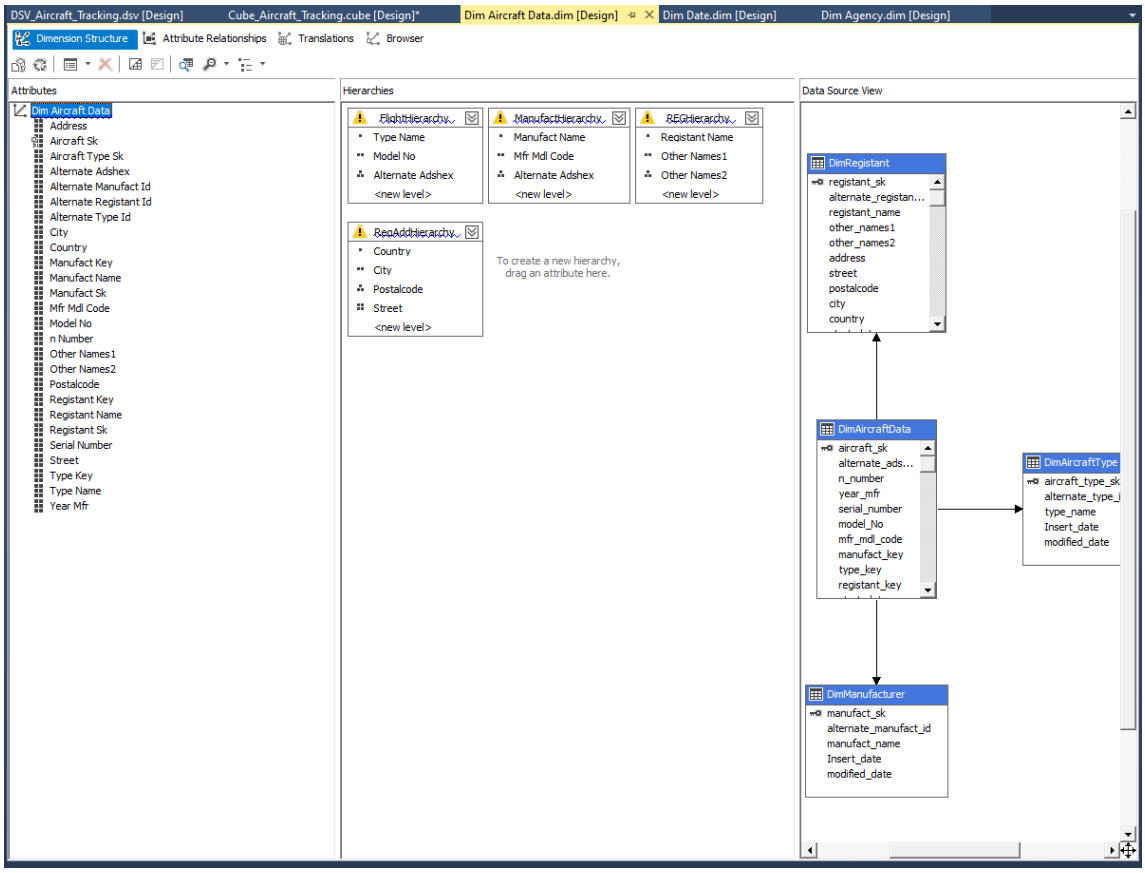
In order to create a sample KPI definition, go back to Data Tools, locate and go to KPIs tab in 'Cube_Aircraft_Tracking' design window ('Cube_Aircraft_Tracking.cube [Design]'). If the design window is not visible you can double click on 'Cube_Aircraft_Tracking.cube' to open the design window. Then, In the KPIs tab, above KPI Organizer panel, locate and click on New KPI button. Alternatively, you right click on KPI Organizer panel area and select New KPI. After following steps for create the KPIs successfully. We can have a KPI like the image given below.

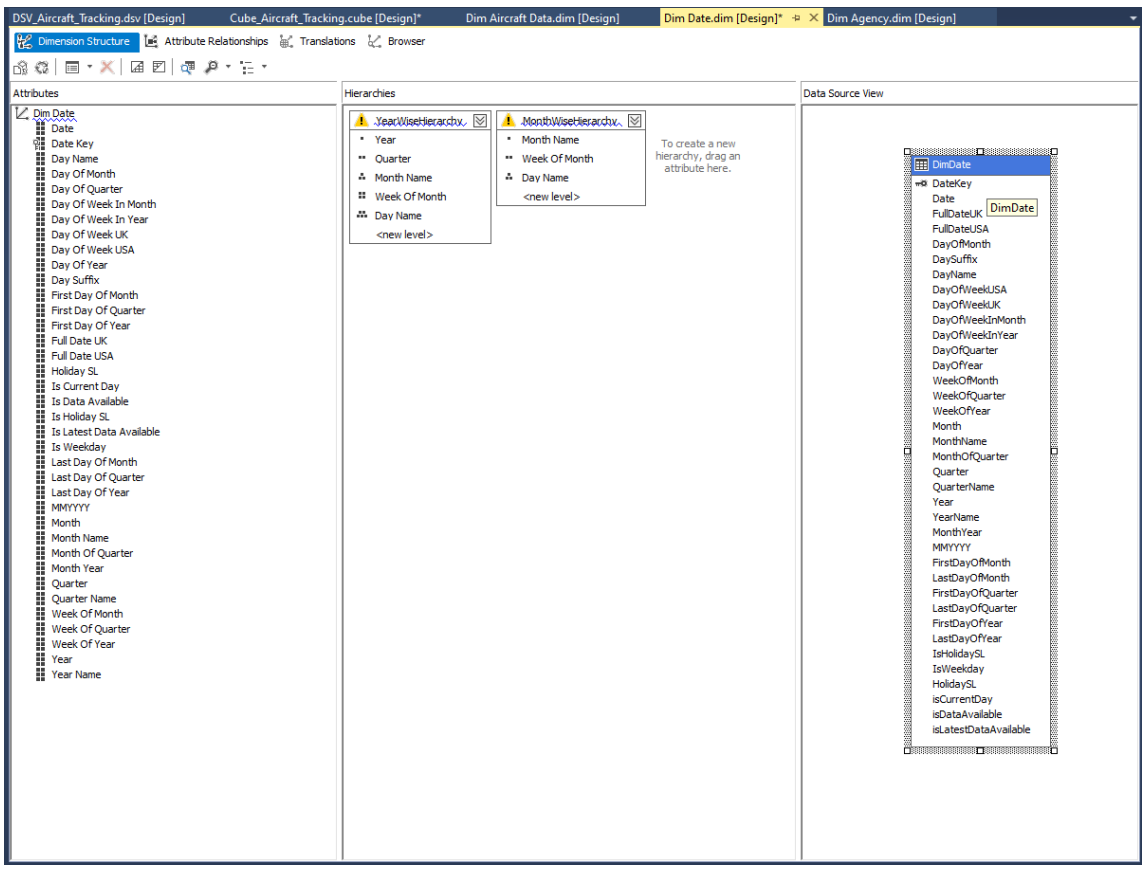


Now you can include the KPI you created in your analysis to the test.



Then we can Do some research on creating hierarchies to dimensions, adding new measures to the cube, creating Business Intelligence, so on. Let's Implement few hierarchies in the cube.

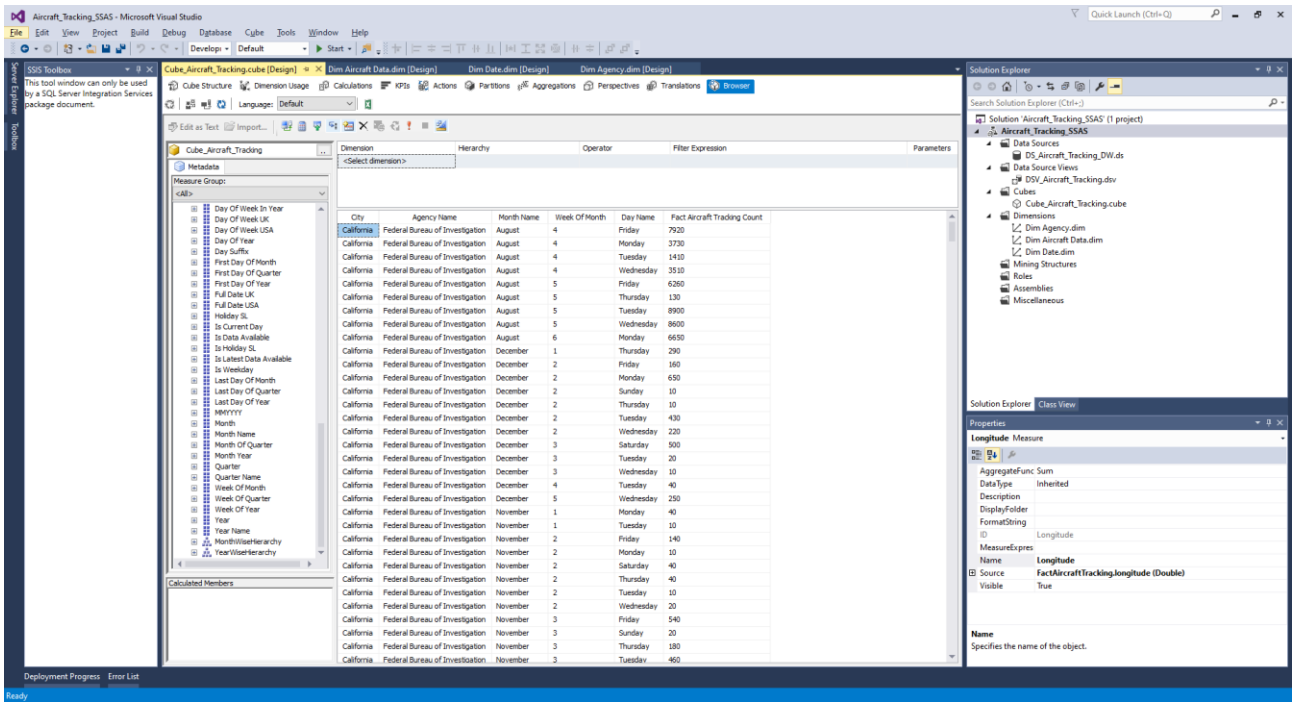




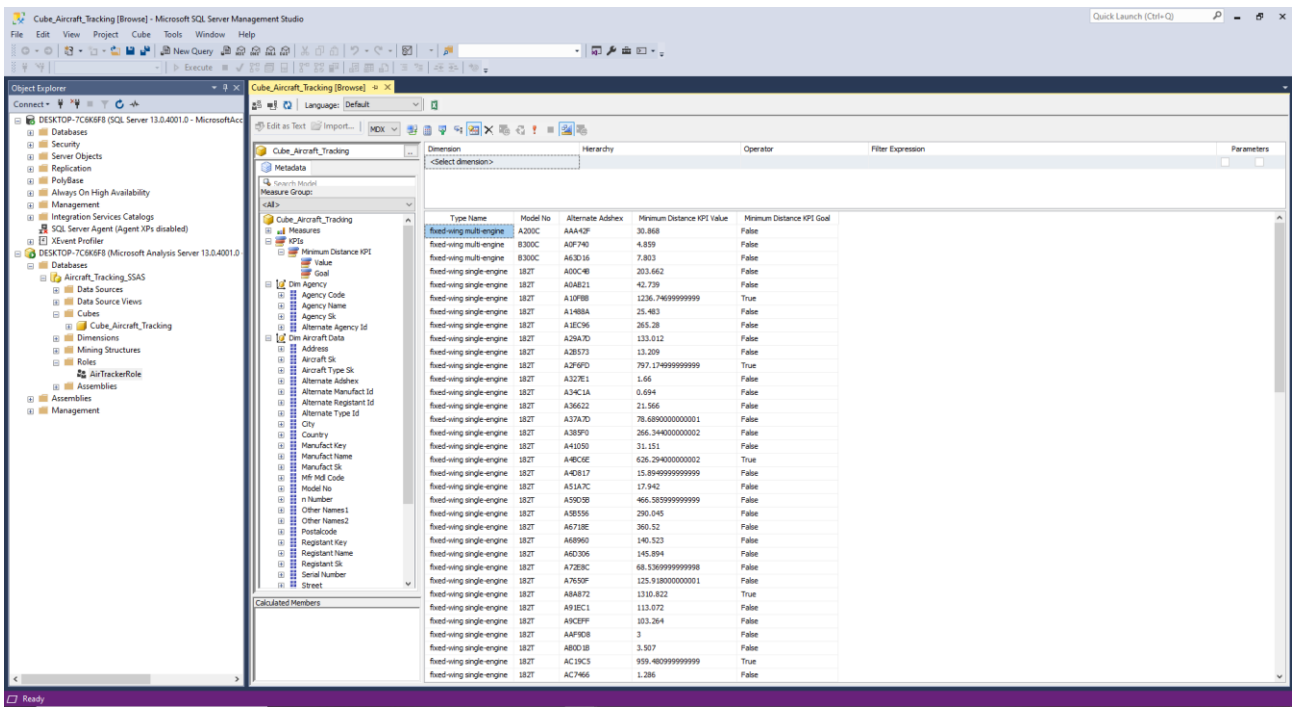
2.7. *Browsing Cube Data*

And after all, as we already know general browsing (analysis) can be done via the development tool; Data Tools or in SSMS. There snapshots included both development tools.

- Microsoft Visual Studio – Test Analyse:



- Microsoft SQL Server Management Studio – Test Analyse:



3. Demonstration of OLAP operations

In here, we will create a simple report in Excel using the data in the cube. There are many ways to access data in the cube.

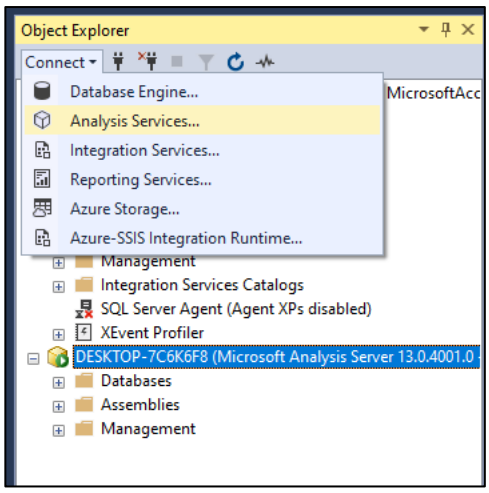
1. using MDX queries/ ***POWERPIVOT*** mode.
2. using features available in ***Data*** tab.

For get more idea I included steps from both steps.

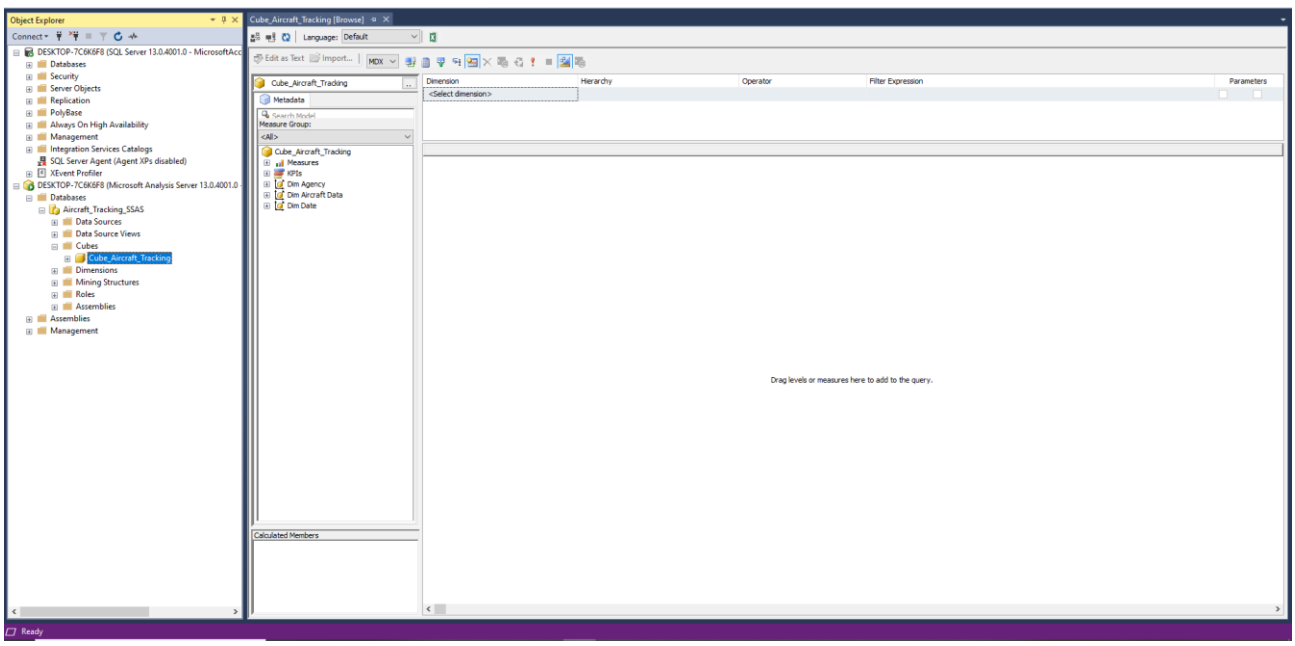
3.1.Using MDX queries/ POWERPIVOT mode.

In order to use the Browser to generate the MDX query, we can use SSMS and connect tot SSAS cube.

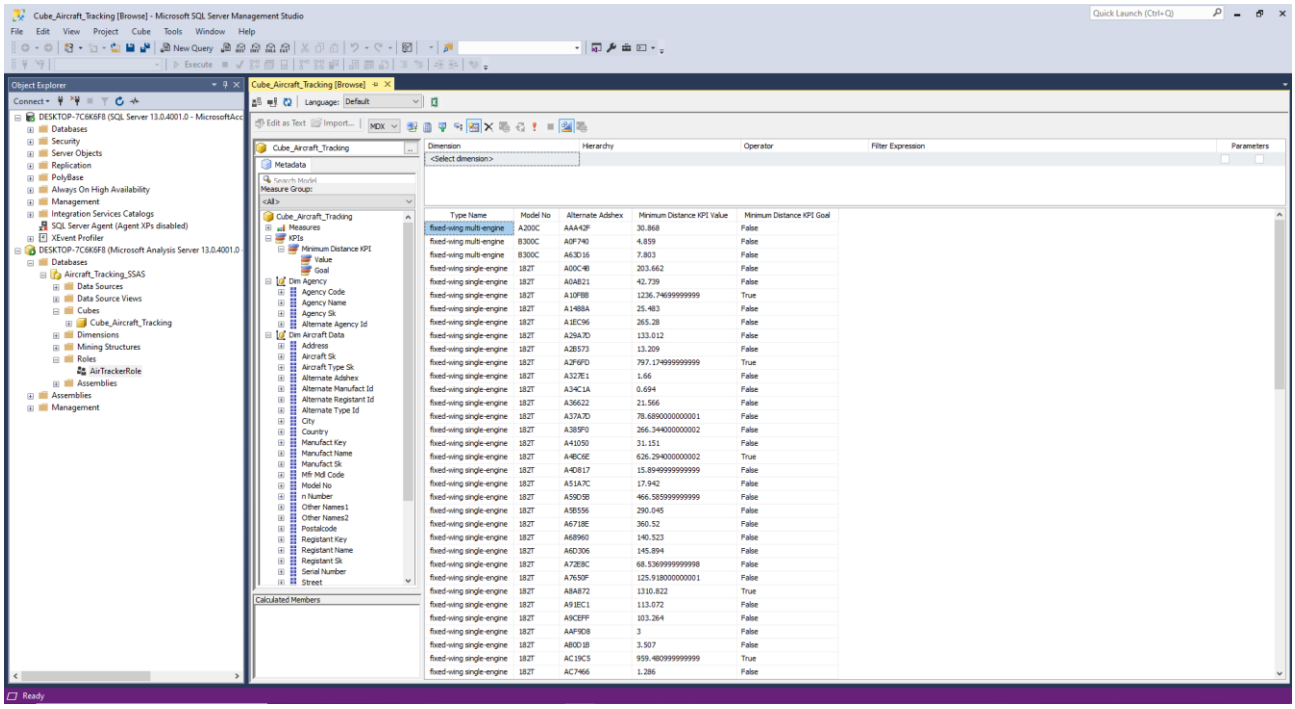
3.1.1. Open SQL Server Management Studio in 'Administrator' mode → Connect to Analysis Services.



3.1.2. There we can open the databases → Cubes → Cube_Aircraft_Tracking → right click → Browse. Then we can see the surface like the image given below.

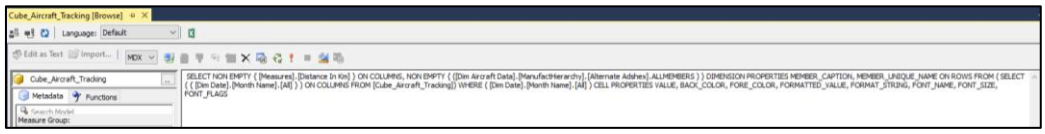


3.1.3. Then you can do the cube analysis, as we done before.

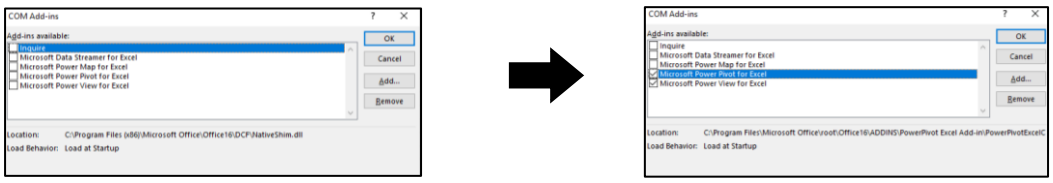


3.1.4. In order to get the MDX query, click the Design Mode

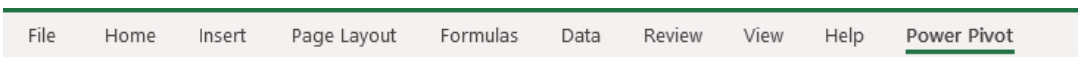
3.1.5. MDX query will be available then to copy.



3.1.6. Open Excel → File → options → Add-ins → There is a dropdown called 'Manage' → select COM Add-ins → Go → Then, COM Add-ins window like given in the image below, will popped up. There you can checked like 2nd image.

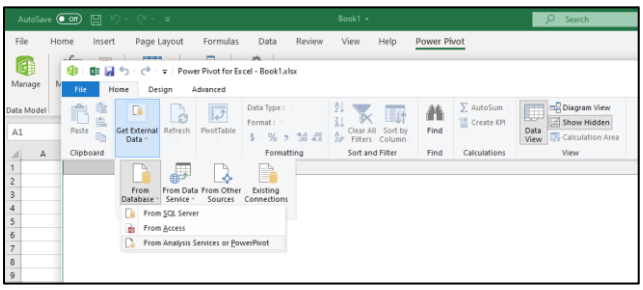


Then a new tab named POWERPIVOT should be available in the Excel workbook now.

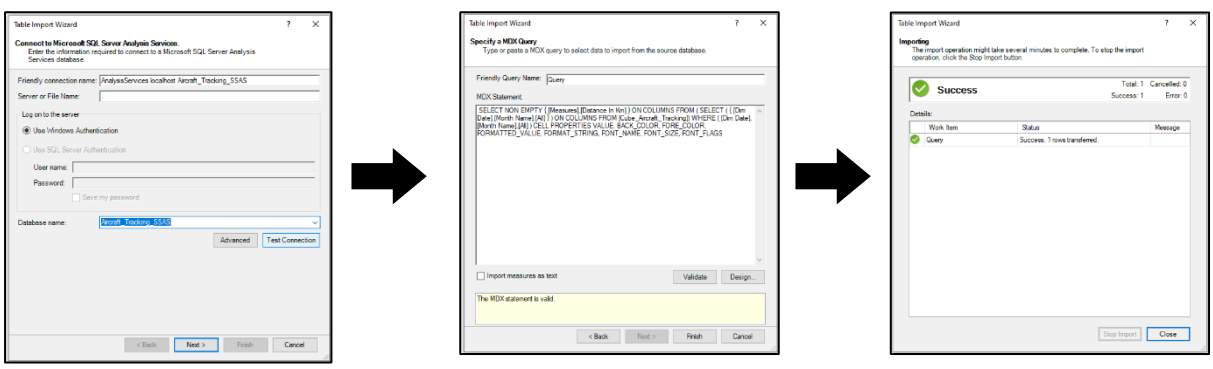


3.1.7. Go to new tab POWERPIVOT → Manage
Then new window will open.

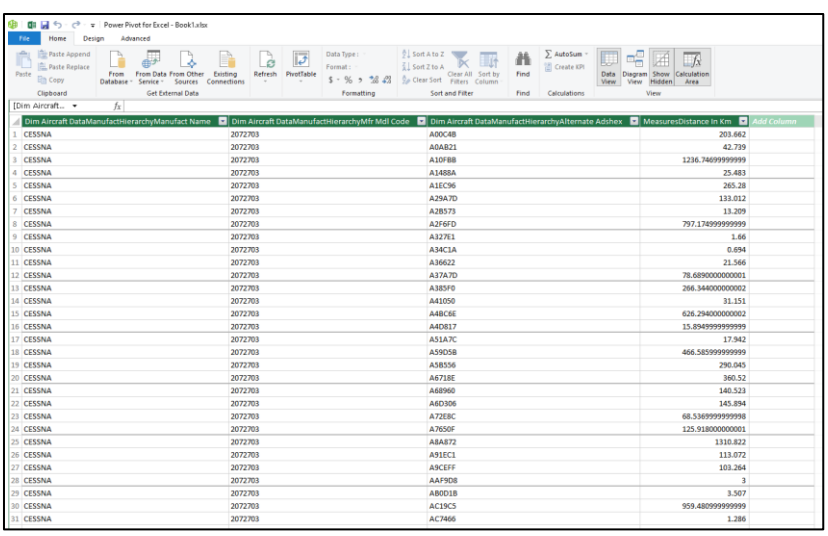
3.1.8. Go to home tab of new window → Get External Data → From Database → From Analysis Service or Power Pivot.



Then provide valid details to the Table import wizard → next → specify a MDX query window will show. There you have to copy the query that you took from SSMS. Then click on validate →Finish → If query imported successful in Table import Wizard → click Close.



Then you may see a window fill with details related to the query like the image given below.

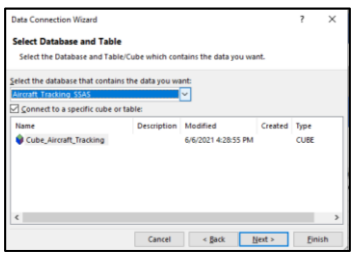


	Dim Aircraft DataManufactHierarchyManufact Name	Dim Aircraft DataManufactHierarchyMfr Mdl Code	Dim Aircraft DataManufactHierarchyAlternate Adshex	MeasuresDistance In Km
1	CESSNA	2072703	A00C4B	203.662
2	CESSNA	2072703	A0AB21	42.739
3	CESSNA	2072703	A10F88	1236.74699999999
4	CESSNA	2072703	A1488A	25.483
5	CESSNA	2072703	A1EC96	265.28
6	CESSNA	2072703	A29A7D	133.012
7	CESSNA	2072703	A2B573	13.209
8	CESSNA	2072703	A2F6FD	797.174999999999
9	CESSNA	2072703	A327E1	1.66
10	CESSNA	2072703	A34C1A	0.694
11	CESSNA	2072703	A36622	21.566
12	CESSNA	2072703	A37A7D	78.6890000000001
13	CESSNA	2072703	A385F0	266.344000000002
14	CESSNA	2072703	A41050	31.151
15	CESSNA	2072703	A4BC6E	626.294000000002
16	CESSNA	2072703	A4D817	15.8949999999999
17	CESSNA	2072703	A51A7C	17.942
18	CESSNA	2072703	A59D5B	466.585999999999
19	CESSNA	2072703	A5B556	290.045
20	CESSNA	2072703	A6718E	360.52
21	CESSNA	2072703	A68960	140.523
22	CESSNA	2072703	A6D306	145.894
23	CESSNA	2072703	A72E8C	68.5369999999998
24	CESSNA	2072703	A7650F	125.918000000001
25	CESSNA	2072703	A8A872	1310.822
26	CESSNA	2072703	A91EC1	113.072
27	CESSNA	2072703	A9CEFF	103.264
28	CESSNA	2072703	AAF9D8	3
29	CESSNA	2072703	AB0D1B	3.507
30	CESSNA	2072703	AC19C5	959.480999999999
31	CESSNA	2072703	AC7466	1.286

3.2.Using features available in Data tab.

As you know we can connect the Excel to SSAS Cube without using MDX queries also. In this way, you can connect with the whole set of fact and dimension tables.

3.2.1. Open a new Excel sheet → Data tab → Get Data → From Database → From Analysis Service. (In the Data Connection Wizard, provide Server Name and Log on credentials) → click Next



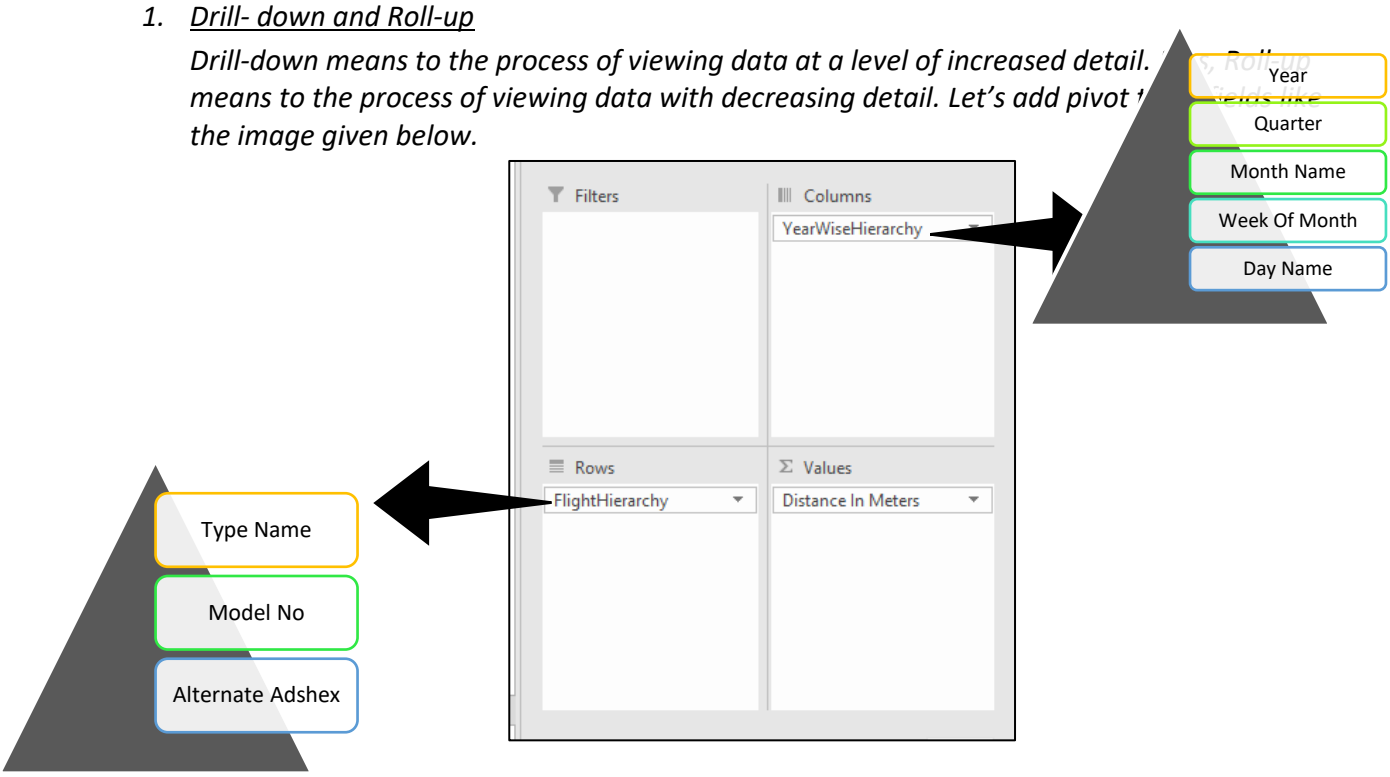
Then select the relevant SSAS database and the cube → Next → Finish (If details are correct) → Import Data window will display → pivotable is default suggestion → OK

This will connect the Excel to the whole set of tables in SSAS cube.

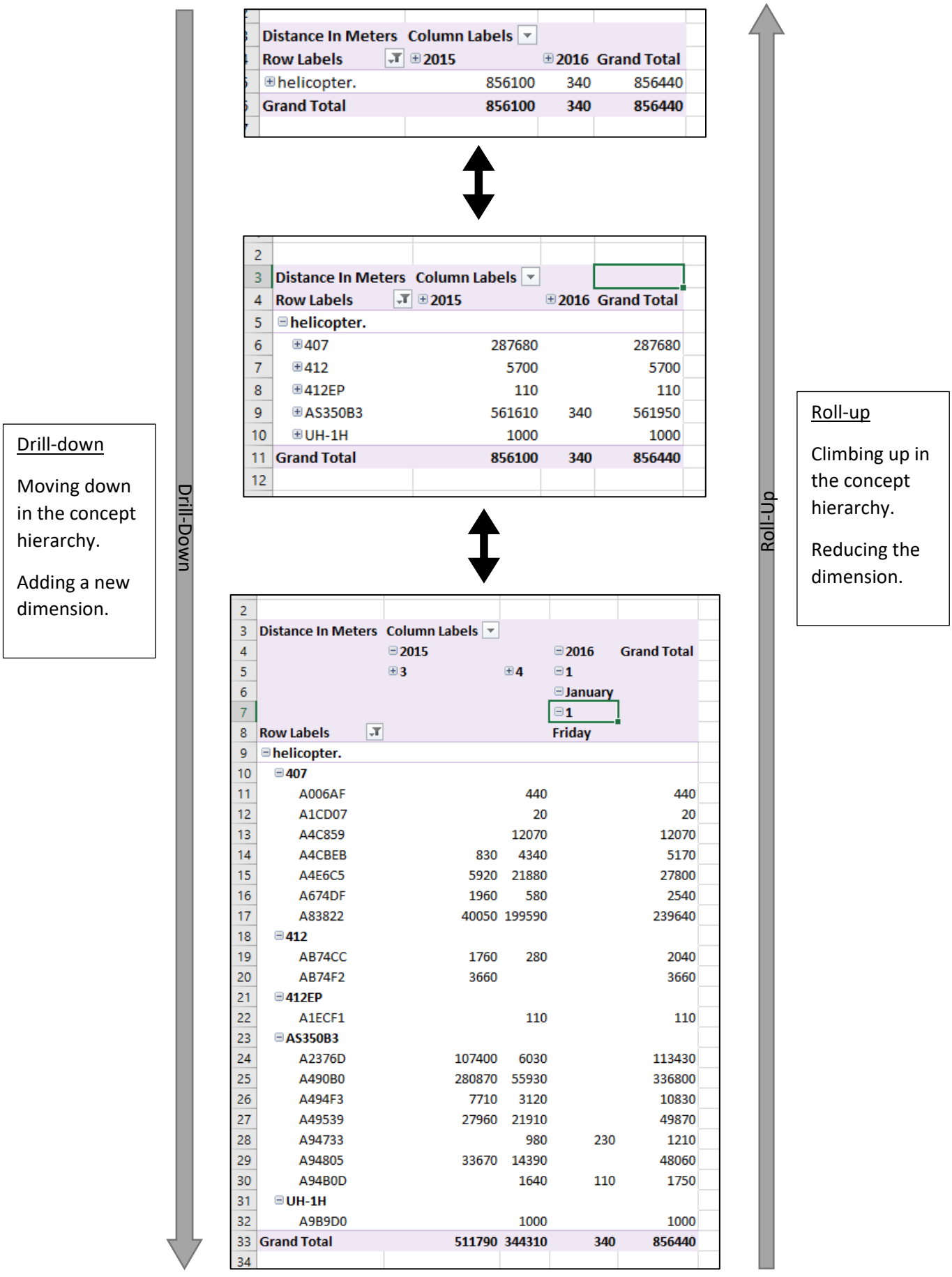
As what we did with MDX query, now we can use any of the fields available and create pivot table, charts or Dashboards. Let's see.

1. *Drill- down and Roll-up*

   Drill-down means to the process of viewing data at a level of increased detail. Roll-up means to the process of viewing data with decreasing detail. Let's add pivot table like the image given below.



It is about aircraft-wise Distance data in meters which also divided year-wise. Then you can have a table like the image given below.



Distance In Meters	Column Labels		
Row Labels	2015	2016	Grand Total
helicopter.	856100	340	856440
Grand Total	856100	340	856440

Distance In Meters	Column Labels		
Row Labels	2015	2016	Grand Total
helicopter.			
407	287680		287680
412	5700		5700
412EP	110		110
AS350B3	561610	340	561950
UH-1H	1000		1000
Grand Total	856100	340	856440

Distance In Meters	Column Labels				
	2015		2016		Grand Total
	3	4	1		
			January		
			1		
Row Labels			Friday		
helicopter.					
407					
A006AF		440			440
A1CD07		20			20
A4C859		12070			12070
A4CBEB	830	4340			5170
A4E6C5	5920	21880			27800
A674DF	1960	580			2540
A83822	40050	199590			239640
412					
AB74CC	1760	280			2040
AB74F2	3660				3660
412EP					
A1ECF1		110			110
AS350B3					
A2376D	107400	6030			113430
A490B0	280870	55930			336800
A494F3	7710	3120			10830
A49539	27960	21910			49870
A94733		980		230	1210
A94805	33670	14390			48060
A94B0D		1640		110	1750
UH-1H					
A9B9D0		1000			1000
Grand Total	511790	344310		340	856440

Drill-down

Moving down in the concept hierarchy.

Adding a new dimension.

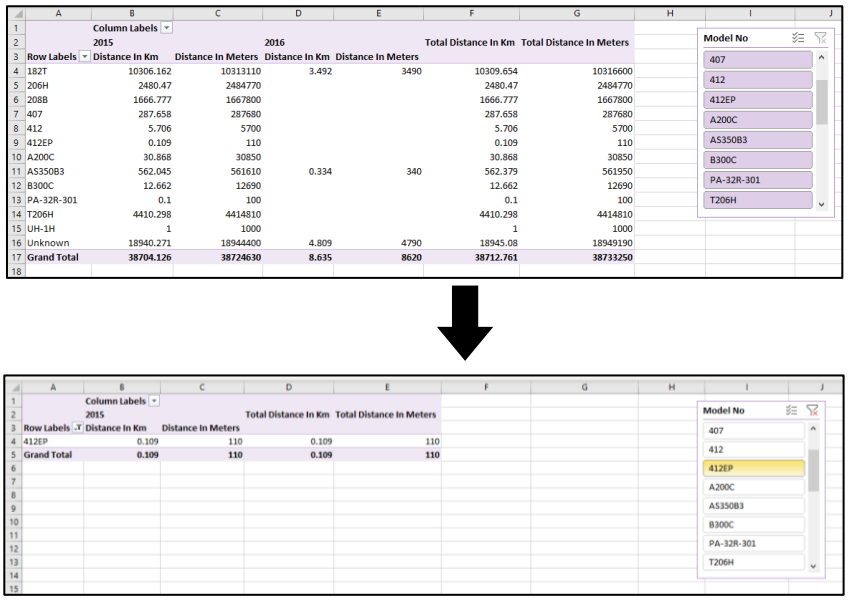
Roll-up

Climbing up in the concept hierarchy.

Reducing the dimension.

2. *Slice*

Slice selects a single dimension from the OLAP cube which results in a new sub-cube creation.



	Column Labels					
	2015		2016		Total Distance In Km	Total Distance In Meters
Row Labels	Distance In Km	Distance In Meters	Distance In Km	Distance In Meters		
182T	10306.162	10313110	3.492	3490	10309.654	10316600
206H	2480.47	2484770			2480.47	2484770
208B	1666.777	1667800			1666.777	1667800
407	287.658	287680			287.658	287680
412	5.706	5700			5.706	5700
412EP	0.109	110			0.109	110
A200C	30.868	30850			30.868	30850
AS350B3	562.045	561610	0.334	340	562.379	561950
B300C	12.662	12690			12.662	12690
PA-32R-301	0.1	100			0.1	100
T206H	4410.298	4414810			4410.298	4414810
UH-1H	1	1000			1	1000
Unknown	18940.271	18944400	4.809	4790	18945.08	18949190
Grand Total	38704.126	38724630	8.635	8620	38712.761	38733250

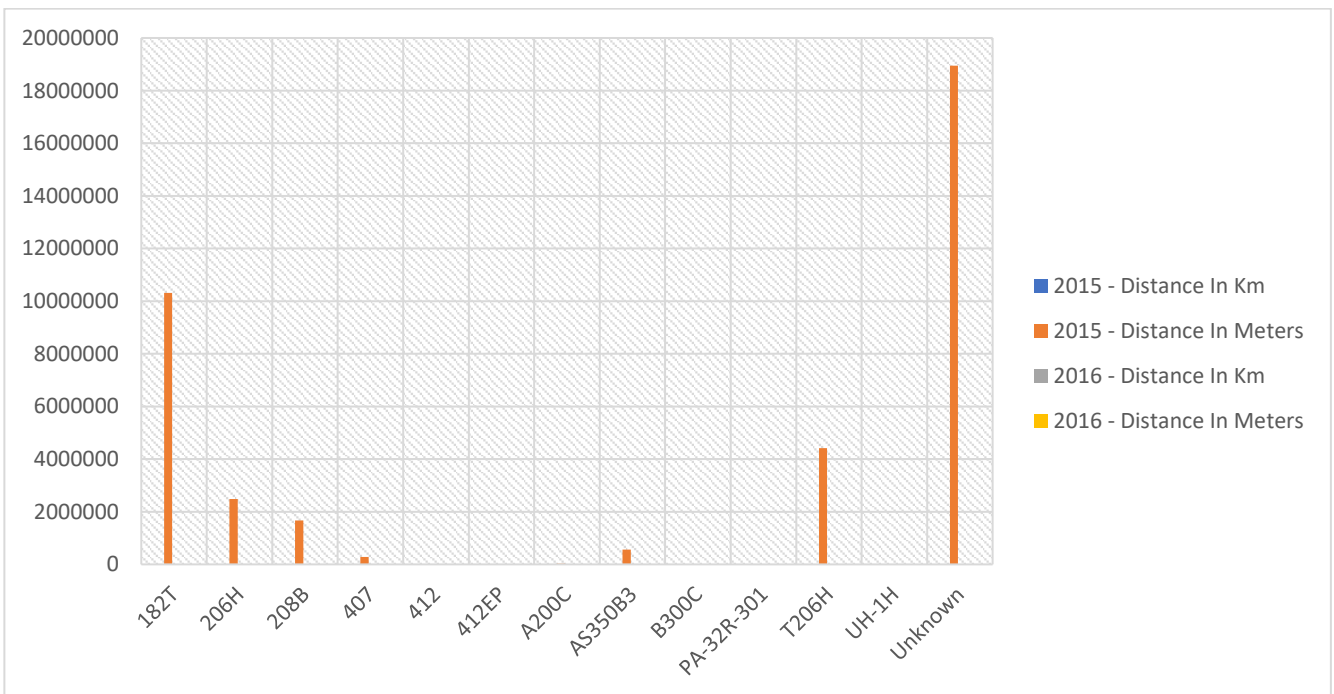
Model No: 407, 412, 412EP, A200C, AS350B3, B300C, PA-32R-301, T206H

	Column Labels			
	2015		Total Distance In Km	Total Distance In Meters
Row Labels	Distance In Km	Distance In Meters		
412EP	0.109	110	0.109	110
Grand Total	0.109	110	0.109	110

Model No: 407, 412, 412EP, A200C, AS350B3, B300C, PA-32R-301, T206H

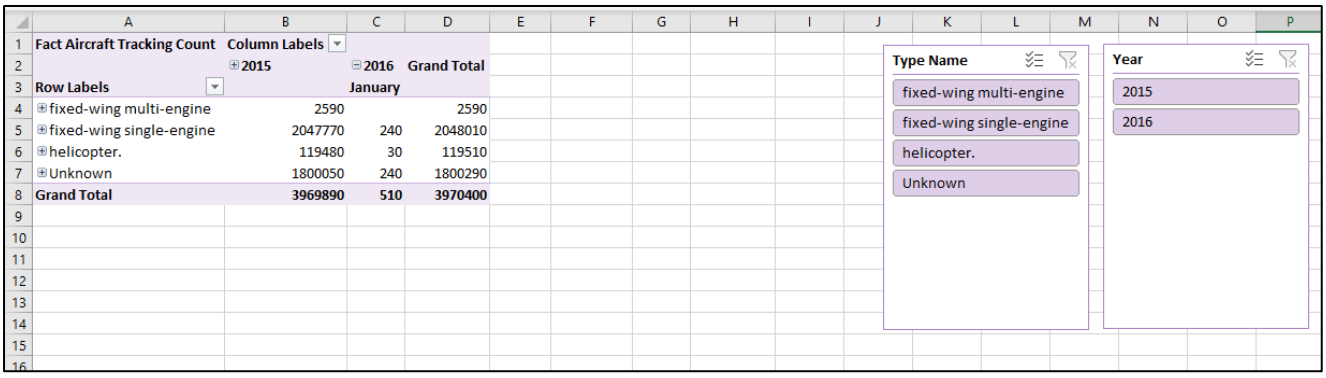
In this above scenario, single dimension's attribute is 'Model No'. According to the model we can see year-wise Distance in meters and kilometres.

We can have graph like image given below.



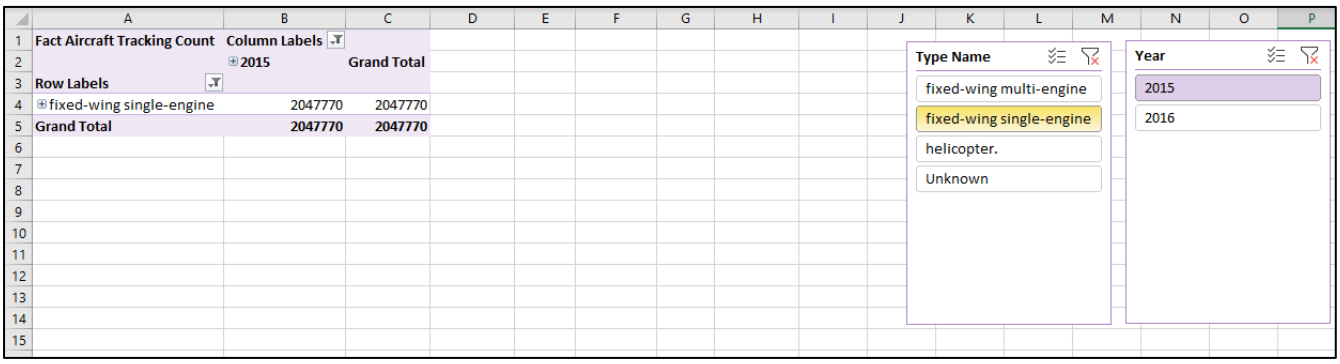
3. *Dice*

Dice selects a sub-cube from the OLAP cube by selecting two or more dimensions. Here we took data from ‘dimDate’ dimension table and, ‘dimAircraftData’ dimension table. Moreover, From ‘dimDate’ table Type name and from ‘dimAircraftData’ table year. But if we took month as a one cube and year as a one cube, we couldn’t consider it as a dice. Because both of cubes from dimDate dimension table. To be a Dice it should be from two or more dimensions.



Fact Aircraft Tracking Count	Column Labels		
	2015	2016	Grand Total
Row Labels		January	
fixed-wing multi-engine	2590		2590
fixed-wing single-engine	2047770	240	2048010
helicopter.	119480	30	119510
Unknown	1800050	240	1800290
Grand Total	**3969890**	**510**	**3970400**

We can have a table given below after we extract count of aircraft data of flight type = ‘fixed-wing-single-engine’ and year= ‘2015’

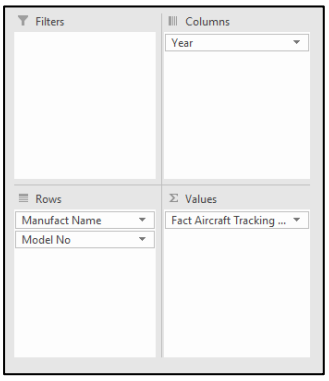


Fact Aircraft Tracking Count	Column Labels	
	2015	Grand Total
Row Labels		
fixed-wing single-engine	2047770	2047770
Grand Total	**2047770**	**2047770**

4. *Pivot*

Pivot is also known as rotation operation as it rotates the current view to get a new view of the representation.

The scenario given below we only change the order of ‘manufacture name’ and ‘model no’.



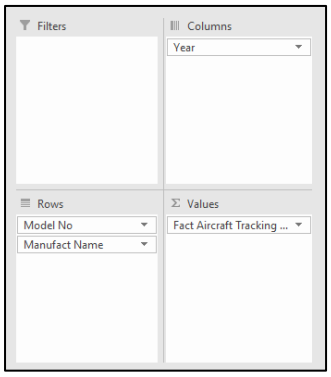
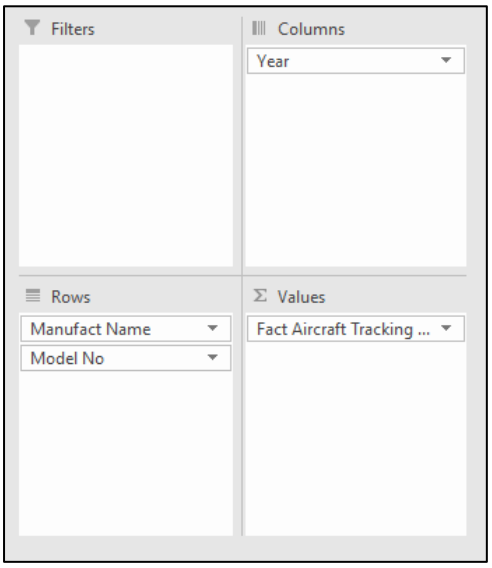
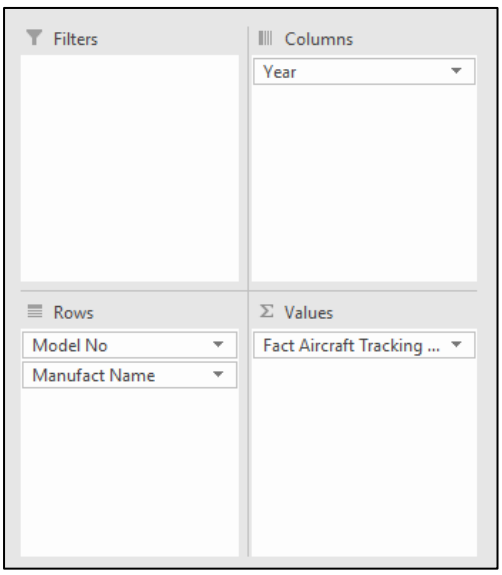


Table of first ‘Manufact Name’, then ‘Model No’.



Fact Aircraft Tracking Count	Column Labels		
Row Labels	2015	2016	Grand Total
AMERICAN EUROCOPTER CORP			
AS350B3	31420	30	31450
AMERICAN EUROCOPTER LLC			
AS350B3	54380		54380
BEECH			
A200C	1860		1860
BEECHCRAFT CORP			
B300C	370		370
BELL			
407	6030		6030
412	640		640
412EP	10		10
UH-1H	70		70
BELL HELICOPTER TEXTRON CANADA			
407	26930		26930
CESSNA			
182T	1149180	240	1149420
206H	276040		276040
208B	155960		155960
T206H	465180		465180
HAWKER BEECHCRAFT CORP			
B300C	360		360
PIPER			
PA-32R-301	10		10
TEXTRON AVIATION INC			
T206H	1400		1400
Unknown			
Unknown	1800050	240	1800290
Grand Total	3969890	510	3970400

Table of first ‘Model No’ then ‘Manufact Name’.



Fact Aircraft Tracking Count	Column Labels		
Row Labels	2015	2016	Grand Total
182T			
CESSNA	1149180	240	1149420
206H			
CESSNA	276040		276040
208B			
CESSNA	155960		155960
407			
BELL	6030		6030
BELL HELICOPTER TEXTRON CANADA	26930		26930
412			
BELL	640		640
412EP			
BELL	10		10
A200C			
BEECH	1860		1860
AS350B3			
AMERICAN EUROCOPTER CORP	31420	30	31450
AMERICAN EUROCOPTER LLC	54380		54380
B300C			
BEECHCRAFT CORP	370		370
HAWKER BEECHCRAFT CORP	360		360
PA-32R-301			
PIPER	10		10
T206H			
CESSNA	465180		465180
TEXTRON AVIATION INC	1400		1400
UH-1H			
BELL	70		70
Unknown			
Unknown	1800050	240	1800290
Grand Total	3969890	510	3970400

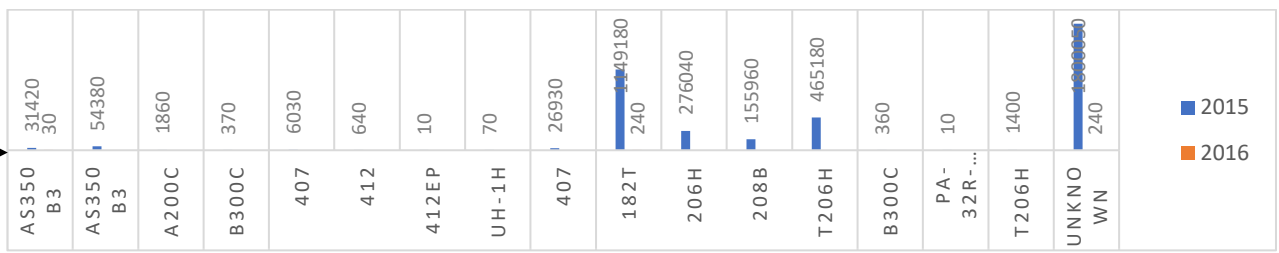
This tables given in the image below shows the same table, but order of ‘Model No’ and ‘Manufact Name’ is change. If we analysis those two tables deeply, we can see that although the ‘grand total’ of both tables are same, but table data looks different. order of ‘Model No’ and ‘Manufact Name’ is change.

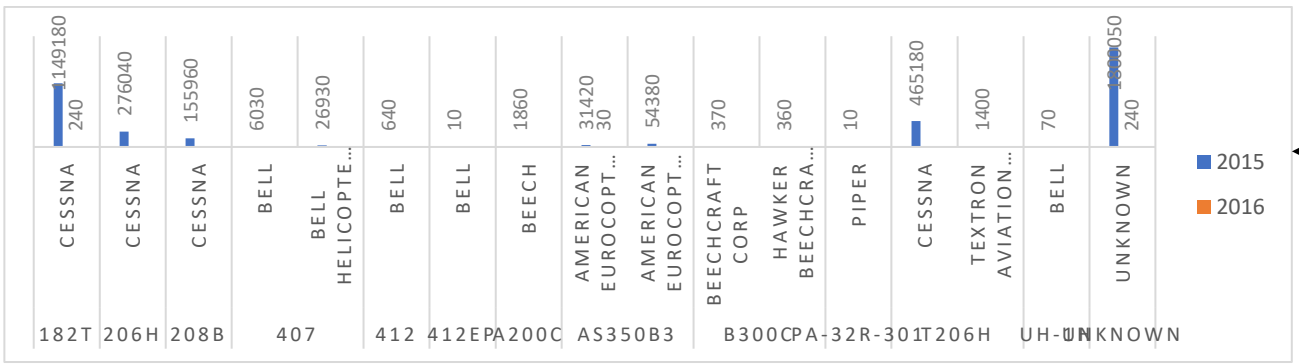
Ex: look at the manufacturer name ‘Piper’ in first table. It only has ‘PA-32R-301’ flight. Then, look at the table. Find the name ‘PA-32R-301’. Then you can see ‘Piper’ is inside it.

If we go more deeply with this analysing, we can see only difference is

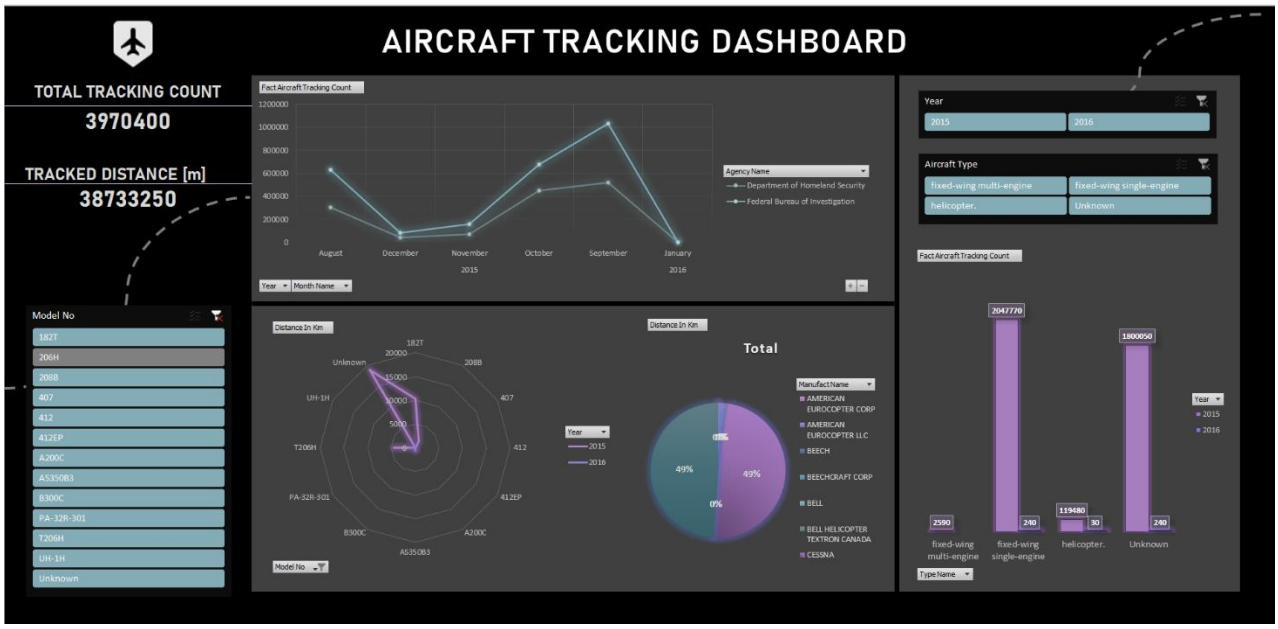
Fact Aircraft Tracking Count	Column Labels		
Row Labels	2015	2016	Grand Total
AMERICAN EUROCOPTER CORP			
AS350B3	31420	30	31450
AMERICAN EUROCOPTER LLC			
AS350B3	54380		54380
BEECH			
A200C	1860		1860
BEECHCRAFT CORP			
B300C	370		370
BELL			
407	6030		6030
412	640		640
412EP	10		10
UH-1H	70		70
BELL HELICOPTER TEXTRON CANADA			
407	26930		26930
CESSNA			
182T	1149180	240	1149420
206H	276040		276040
208B	155960		155960
T206H	465180		465180
HAWKER BEECHCRAFT CORP			
B300C	360		360
PIPER			
PA-32R-301	10		10
TEXTRON AVIATION INC			
T206H	1400		1400
Unknown			
Unknown	1800050	240	1800290
Grand Total	3969890	510	3970400

Fact Aircraft Tracking Count	Column Labels		
Row Labels	2015	2016	Grand Total
182T			
CESSNA	1149180	240	1149420
206H			
CESSNA	276040		276040
208B			
CESSNA	155960		155960
407			
BELL	6030		6030
BELL HELICOPTER TEXTRON CANADA	26930		26930
412			
BELL	640		640
412EP			
BELL	10		10
A200C			
BEECH	1860		1860
AS350B3			
AMERICAN EUROCOPTER CORP	31420	30	31450
AMERICAN EUROCOPTER LLC	54380		54380
B300C			
BEECHCRAFT CORP	370		370
HAWKER BEECHCRAFT CORP	360		360
PA-32R-301			
PIPER	10		10
T206H			
CESSNA	465180		465180
TEXTRON AVIATION INC	1400		1400
UH-1H			
BELL	70		70
Unknown			
Unknown	1800050	240	1800290
Grand Total	3969890	510	3970400

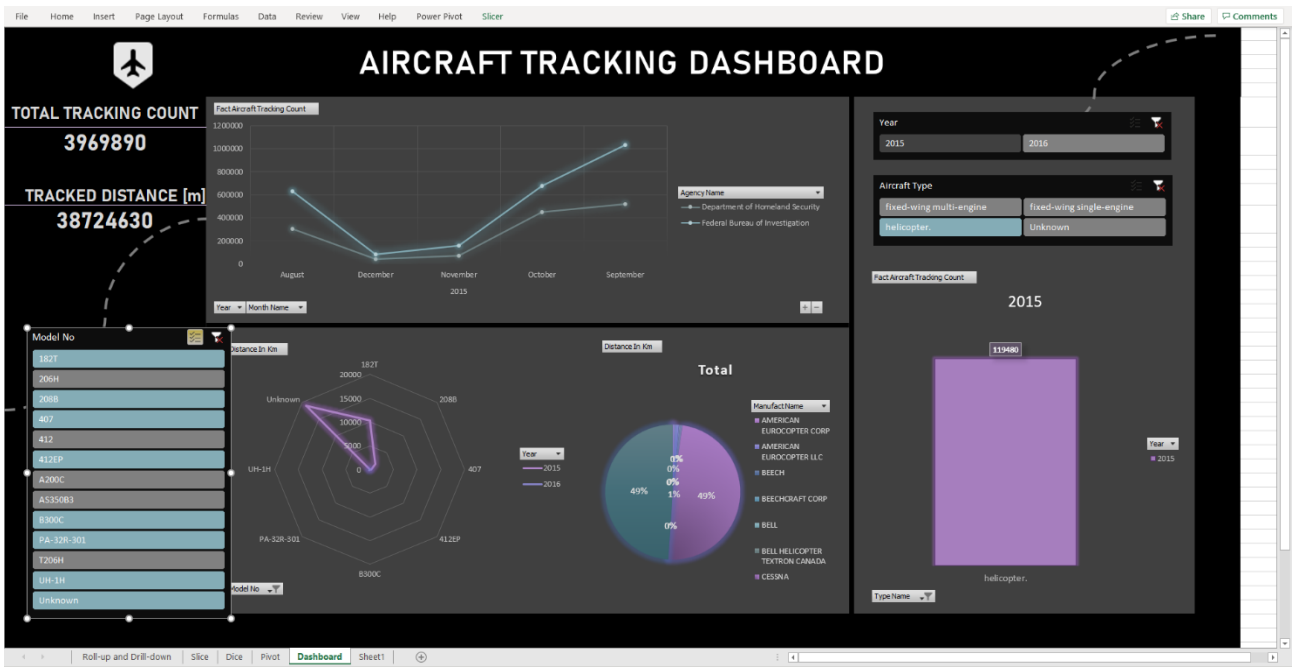




Dashboard



I created this dashboard using Microsoft Excel. This whole dashboard can show the changes according to the year. The image given below show the dashboard after filtered out.



The slices and dices pivot charts also I inserted there to make this dashboard more efficient.

4. SSRS Reports

I have Developed and published the reports given below in SSRS Web Portal.

Followed steps given below:

4.1. First, I have opened the reporting service configuration manager.

4.2. Then, connected to the server using my credentials.

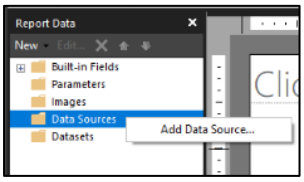
4.3. After that follow the practical sheet 8 to Configure SQL server reporting services.

4.4. Paginated reports can be created using SQL Server Data Tools or Report Builder, but I have used light weight tool 'Report Builder'. After opening it we need to follow the report creating steps.

4.5.1 First, we need to create a Data Source.

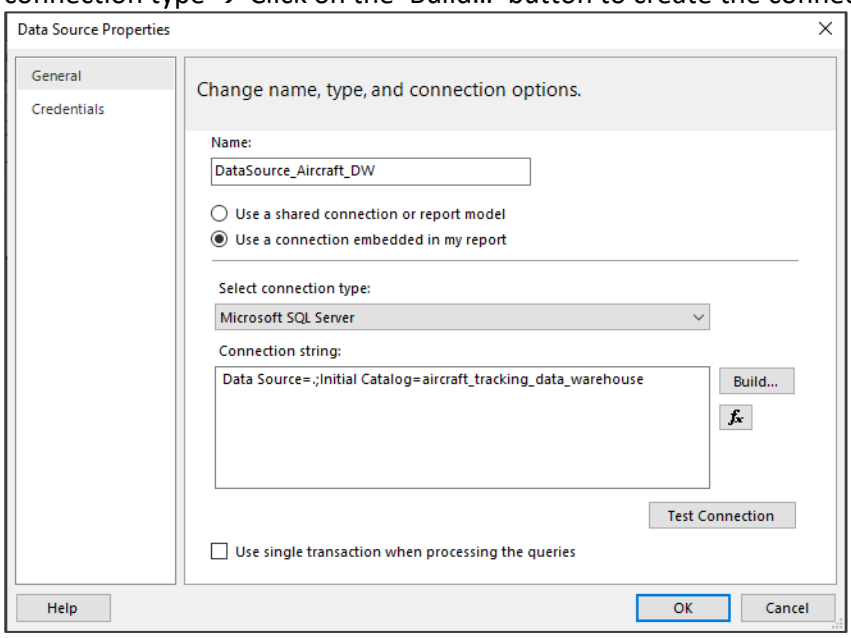
Data source is a connection to the source of the data. In here, I have used data in the data warehouse, data source is the data warehouse I have built ('DataSource_Aircraft_DW').

4.5.1.1 Right clicked on the Data Sources → click Added Data Sources…

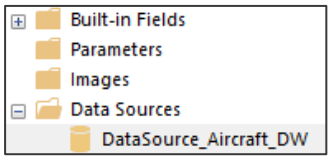


4.5.1.1 Provided a data source name as 'DataSource_Aircraft_DW'.

4.5.1.1 Then selected 'Use a connection embedded in my report' → Microsoft SQL Server as the connection type → Click on the 'Build…' button to create the connection → OK



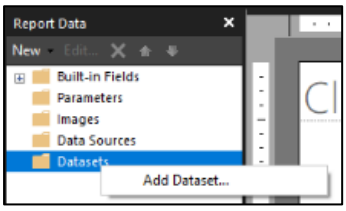
Then I could be able to see the created connection under 'Data Sources'.



4.5.2 Next, we need to create a Dataset.

Dataset is the actual data that will be loaded for used the report visualizations.

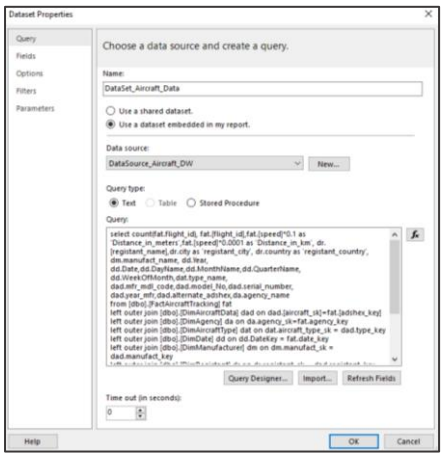
4.5.2.1 Right click on the Datasets → click Add Dataset…



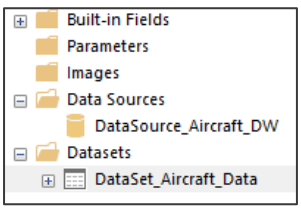
4.5.2.1 In the Query section, provide a dataset name as 'DataSet_Aircraft_Data'.

4.5.2.1 Then, select 'Use a dataset embedded in my report' → Select the data source I have created earlier, 'DataSource_Aircraft_DW' → select 'Text' as the Query type

4.5.2.1 Click on the Query Designer… → Paste the query we executed for according to my need → we can execute the query using '!' in the query window. After it ran without any issue → Review what is there in other sections Fields, Options, Filters and Parameters → OK



Then I could be able to see the created dataset under 'Datasets'.



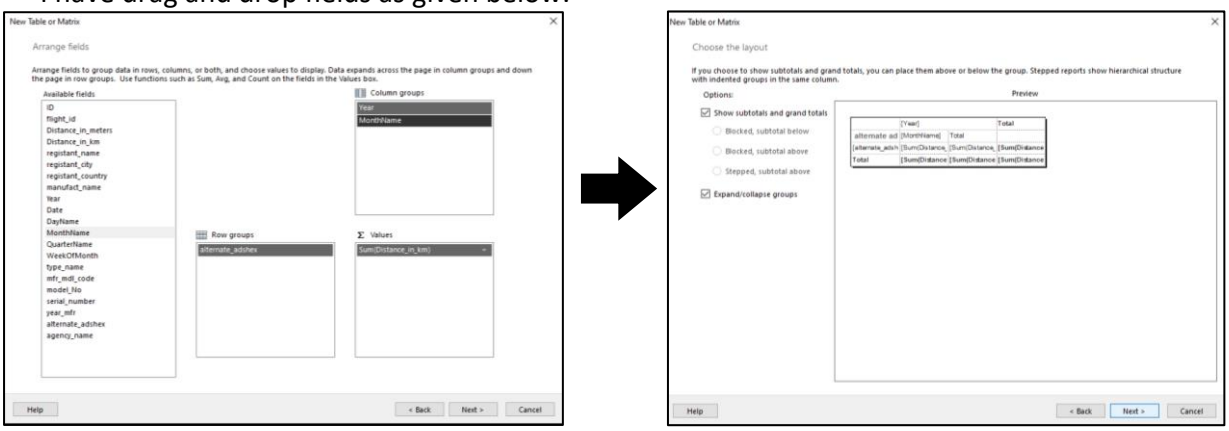
*Query I have executed in 'Query Designer':

```
select count(fat.flight_id), fat.[flight_id],fat.[speed]*0.1 as 'Distance_in_meters',fat.[speed]*0.0001 as 'Distance_in_km', dr.[registant_name],dr.city as 'registant_city', dr.country as 'registant_country',dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name, dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
from [dbo].[FactAircraftTracking] fat
left outer join [dbo].[DimAircraftData] dad on dad.[aircraft_sk]=fat.[adshex_key]
left outer join [dbo].[DimAgency] da on da.agency_sk=fat.agency_key
left outer join [dbo].[DimAircraftType] dat on dat.aircraft_type_sk = dad.type_key
left outer join [dbo].[DimDate] dd on dd.DateKey = fat.date_key
left outer join [dbo].[DimManufacturer] dm on dm.manufact_sk = dad.manufact_key
left outer join [dbo].[DimRegistant] dr on dr.registant_sk = dad.registant_key
group by  fat.[flight_id],fat.[speed]*0.1 ,fat.[speed]*0.0001 , dr.[registant_name],dr.city , dr.country,dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name, dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
```

4.5.3 Then, Create the visualization in my report.

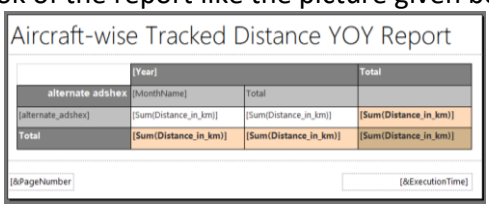
Report 1: Report with a matrix

1. Go to 'Insert' tab on the ribbon of the Report Builder → select Table → Table Wizard... → to open the New Table or Matrix Wizard
2. Chose the 'DataSet_Aircraft_Data' which was created as the dataset → next
3. At the point of selecting fields for Row groups and Column groups.
   I have drag and drop fields as given below.

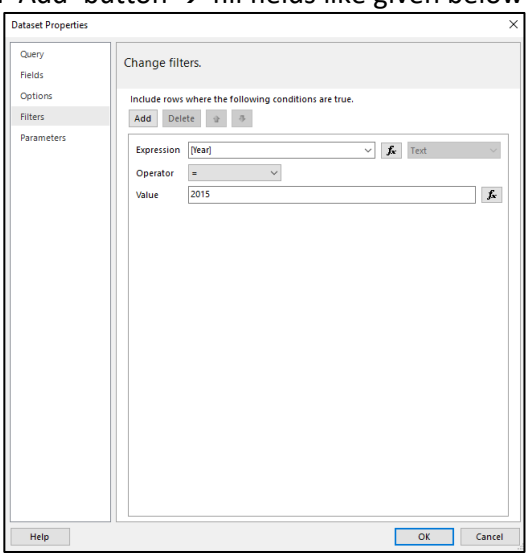


After that you can finished review the rest windows in the wizard.

4. Then, you could be able to see a matrix inserted in to the report body. I have provided a suitable report title and design the look of the report like the picture given below.

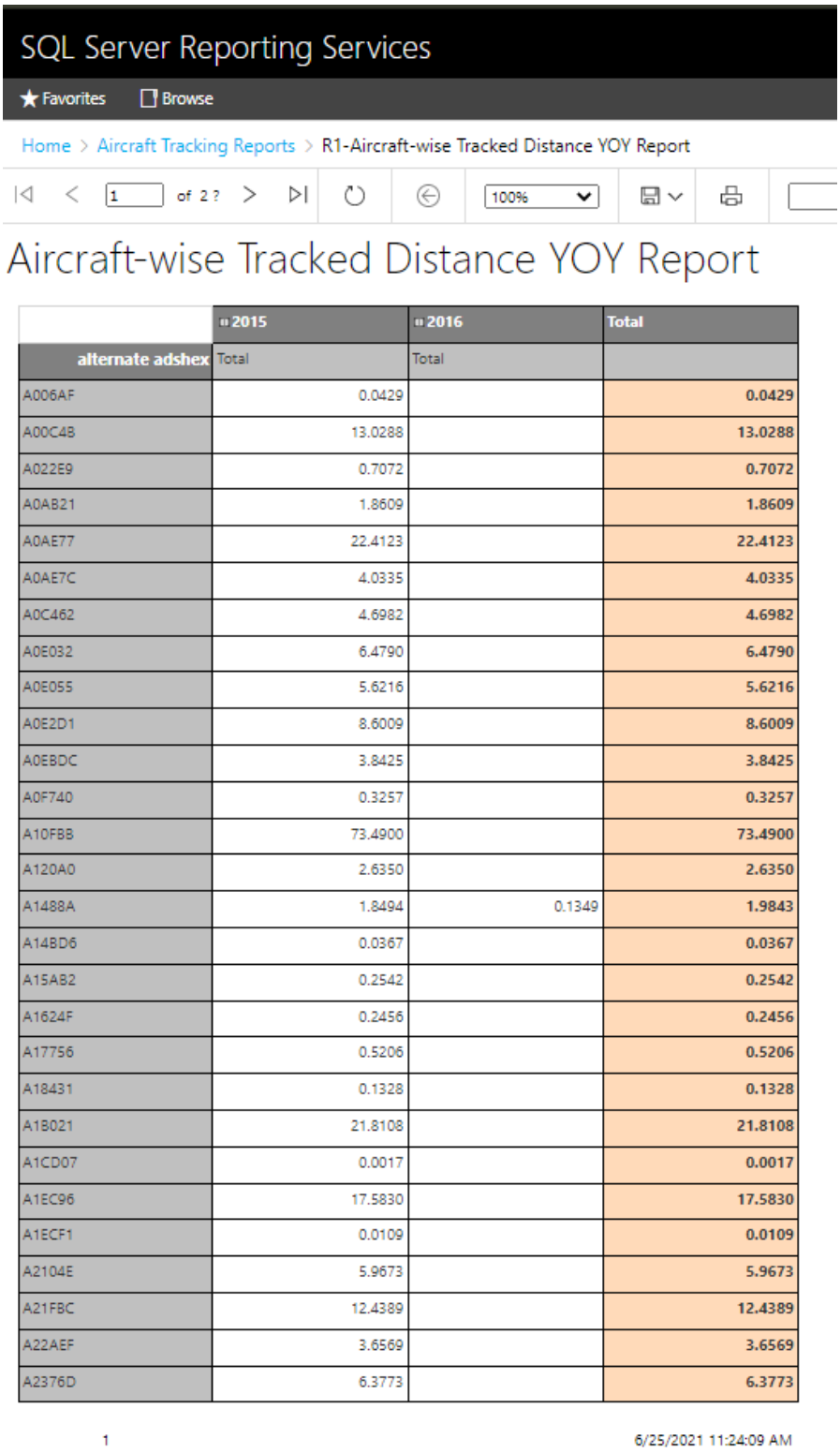


5. Since I wanted to limit (filter) data based on the year to keep the report clean and less crowded. I have filtered the dataset.
   For that, right click on the data set 'DataSet_Aircraft_Data'→ select 'Dataset Properties' → Go to 'Filters section' → click on 'Add' button → fill fields like given below → OK



Although my dataset is limited to 2 years, I have eliminated this optional method to have a report.

6. After we run the report via the Portal of SSRS we can have a report like given above.



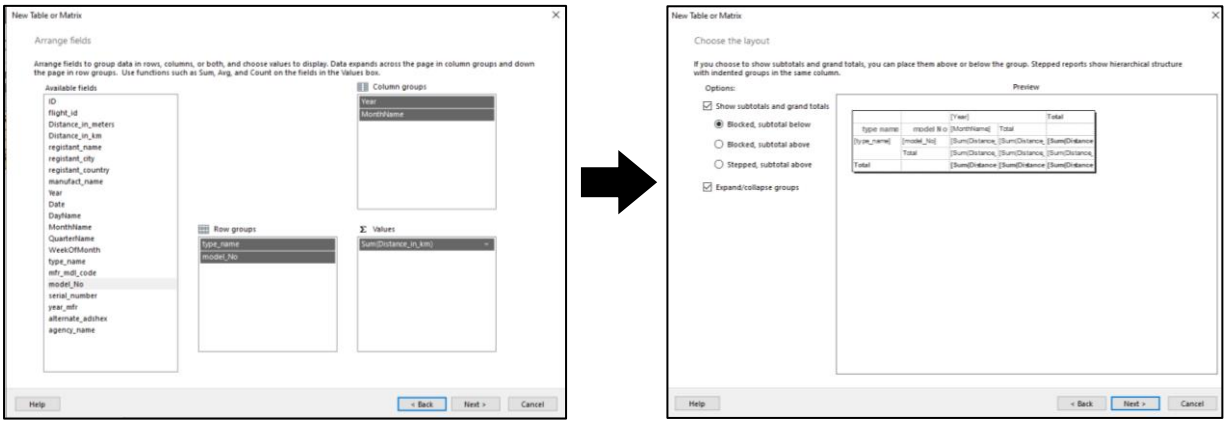
Aircraft-wise Tracked Distance YOY Report

	2015	2016	Total
alternate adshex	Total	Total	
A006AF	0.0429		0.0429
A00C4B	13.0288		13.0288
A022E9	0.7072		0.7072
A0AB21	1.8609		1.8609
A0AE77	22.4123		22.4123
A0AE7C	4.0335		4.0335
A0C462	4.6982		4.6982
A0E032	6.4790		6.4790
A0E055	5.6216		5.6216
A0E2D1	8.6009		8.6009
A0EBDC	3.8425		3.8425
A0F740	0.3257		0.3257
A10FBB	73.4900		73.4900
A120A0	2.6350		2.6350
A1488A	1.8494	0.1349	1.9843
A14BD6	0.0367		0.0367
A15AB2	0.2542		0.2542
A1624F	0.2456		0.2456
A17756	0.5206		0.5206
A18431	0.1328		0.1328
A1B021	21.8108		21.8108
A1CD07	0.0017		0.0017
A1EC96	17.5830		17.5830
A1ECF1	0.0109		0.0109
A2104E	5.9673		5.9673
A21FBC	12.4389		12.4389
A22AEF	3.6569		3.6569
A2376D	6.3773		6.3773

1 6/25/2021 11:24:09 AM

Report 2: Parameterized Report

1. First, we have to followed 4.5.2 steps, then, we can continue with the steps below to create a Parameterized Report
2. Go to 'Insert' tab on the ribbon of the Report Builder → select Table → Table Wizard... → to open the New Table or Matrix Wizard
3. Chose the 'DataSet_Aircraft_Data' which was created as the dataset → next
4. At the point of selecting fields for Row groups and Column groups.
   I have drag and drop fields as given below.



After that you can finished review the rest windows in the wizard.

5. Then, you could be able to see a matrix inserted in to the report body. I have provided a suitable report title and design the look of the report like the picture given below.

Aircrafttype and Manufacturer-wise Tracked Distance Monthly Report

		[Year]		Total Distance (km)
type name	model No	[MonthName]	Total	
[type_name]	[model_No]	[Sum(Distance_in_km)]	[Sum(Distance_in_km)]	**[Sum(Distance_in_km)]**
	Total	[Sum(Distance_in_km)]	[Sum(Distance_in_km)]	[Sum(Distance_in_km)]
Total Distance (km)		**[Sum(Distance_in_km)]**	**[Sum(Distance_in_km)]**	**[Sum(Distance_in_km)]**

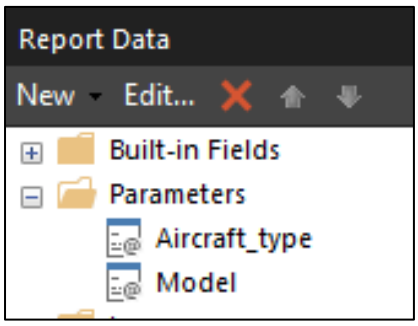
6. Let's add parameters
   6.1 We need to add a where' clause to the dataset that we created as 'DataSet_Aircraft_Data'.
   Right click on the dataset 'DataSet_Aircraft_Data' → select 'Dataset Properties'
   Change the query adding the below where clause.

where dat.aircraft_type_sk = @atsk AND dad.model_No = @md

Then you can have a query like given below.

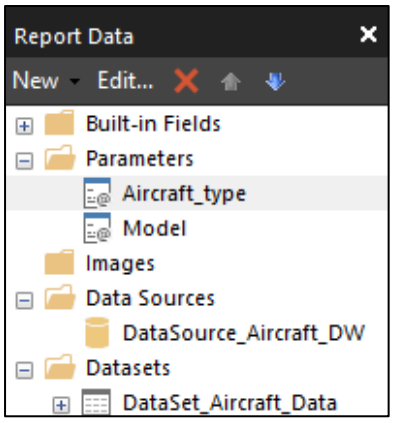
```
select count(fat.flight_id), fat.[flight_id],fat.[speed]*0.1 as 'Distance_in_meters',fat.[speed]*0.0001 as
'Distance_in_km', dr.[registant_name],dr.city as 'registant_city', dr.country as 'registant_country',
dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name,
dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
from [dbo].[FactAircraftTracking] fat
left outer join [dbo].[DimAircraftData] dad on dad.[aircraft_sk]=fat.[adshex_key]
left outer join [dbo].[DimAgency] da on da.agency_sk=fat.agency_key
left outer join [dbo].[DimAircraftType] dat on dat.aircraft_type_sk = dad.type_key
left outer join [dbo].[DimDate] dd on dd.DateKey = fat.date_key
left outer join [dbo].[DimManufacturer] dm on dm.manufact_sk = dad.manufact_key
left outer join [dbo].[DimRegistant] dr on dr.registant_sk = dad.registant_key
where dat.aircraft_type_sk = @atsk AND dad.model_No = @md
group by  fat.[flight_id],fat.[speed]*0.1 ,fat.[speed]*0.0001 , dr.[registant_name],dr.city , dr.country,
dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name,
dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
```

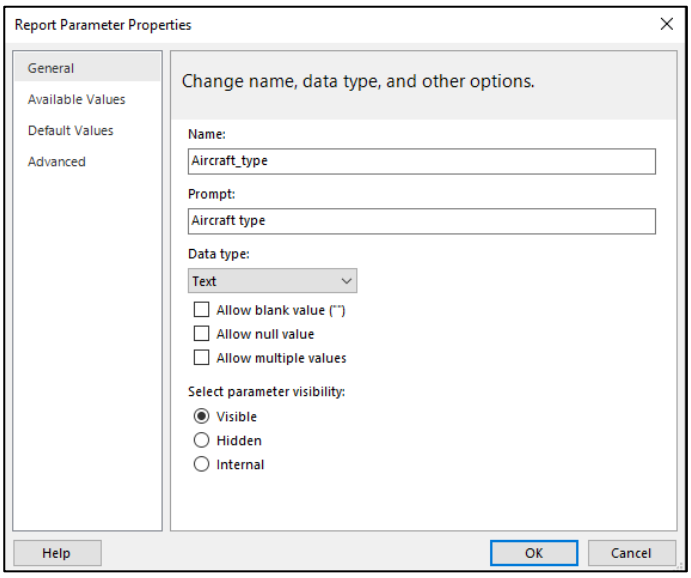
The parameters will be created under Parameters as below



6.2 First, Right click on the parameter 'Aircraft_type' → select Parameter Properties

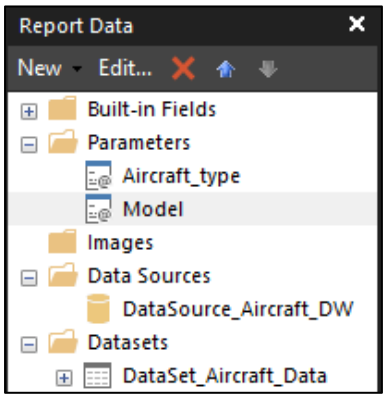
6.3 In General section, Name is 'Aircraft_type' and Prompt is also 'Aircraft_type' → Change the Prompt value to 'Aircraft type'.

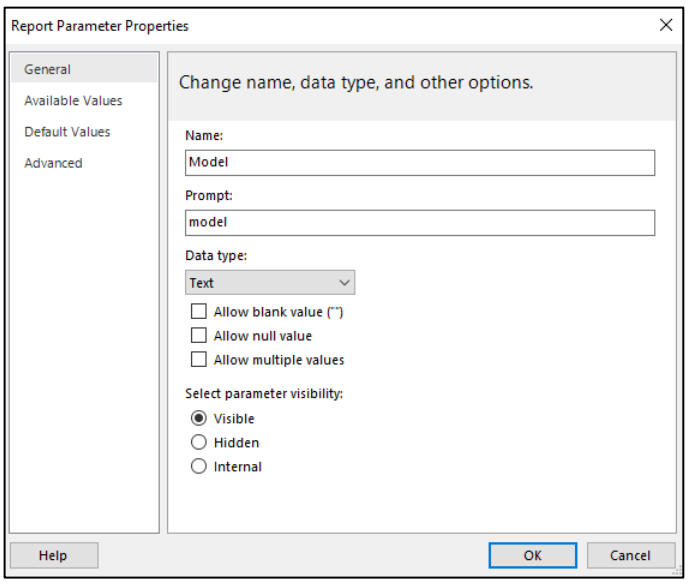




6.4 Then, Right click on the parameter ‘Model’ → select Parameter Properties

6.5 In General section, Name is ‘Model’ and Prompt is also ‘Model’ → Change the Prompt value to ‘model’.

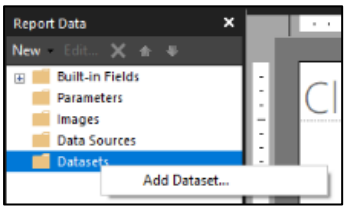




6.6 After that, Saved the report to the portal by giving a suitable name.

7. Then, we have to add the lists of values to the parameters

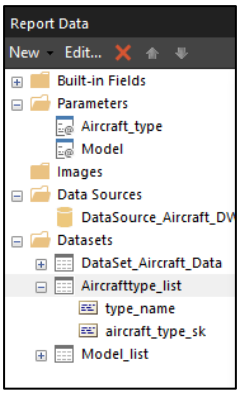
7.1 Right click on the Datasets → click Add Dataset… → dataset properties window will open

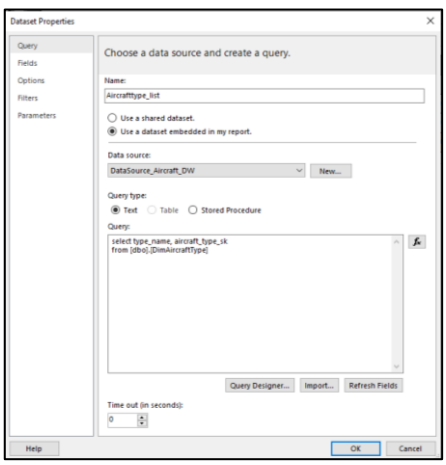


7.2 In the Query section, provide a dataset name as ‘Aircrafttype_list.

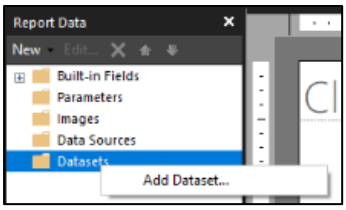
7.3 Then, select ‘Use a dataset embedded in my report’ → Select the data source I have created earlier, ‘DataSource_Aircraft_DW’ → select ‘Text’ as the Query type

7.4 Click on the Query Designer… → Paste the query we executed for according to my need → we can execute the query using ‘!’ in the query window. After it ran without any issue → Review what is there in other sections Fields, Options, Filters and Parameters → OK





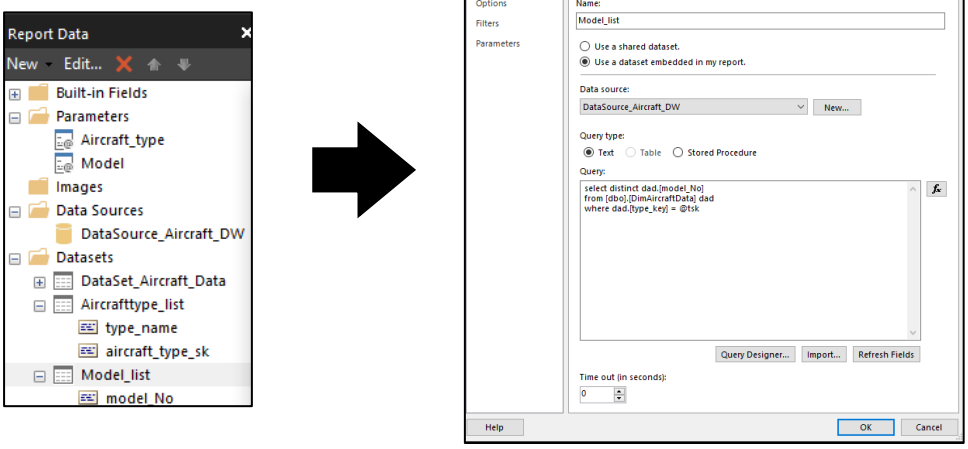
7.5 Then again, Right click on the Datasets → click Add Dataset… → dataset properties window will open



7.6 In the Query section, provide a dataset name as 'Model_list.

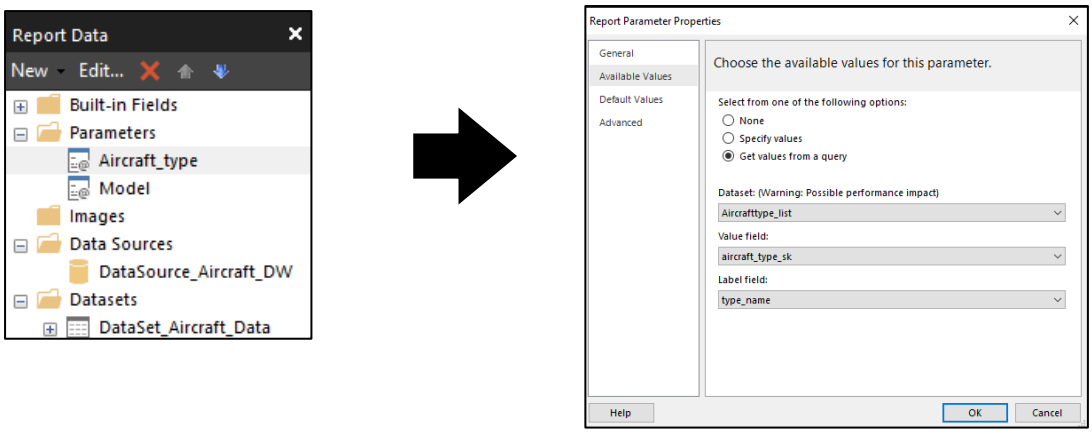
7.7 Then, select 'Use a dataset embedded in my report' → Select the data source I have created earlier, 'DataSource_Aircraft_DW' → select 'Text' as the Query type

7.8 Click on the Query Designer… → Paste the query we executed for according to my need → we can execute the query using '!' in the query window. After it ran without any issue → Review what is there in other sections Fields, Options, Filters and Parameters → OK



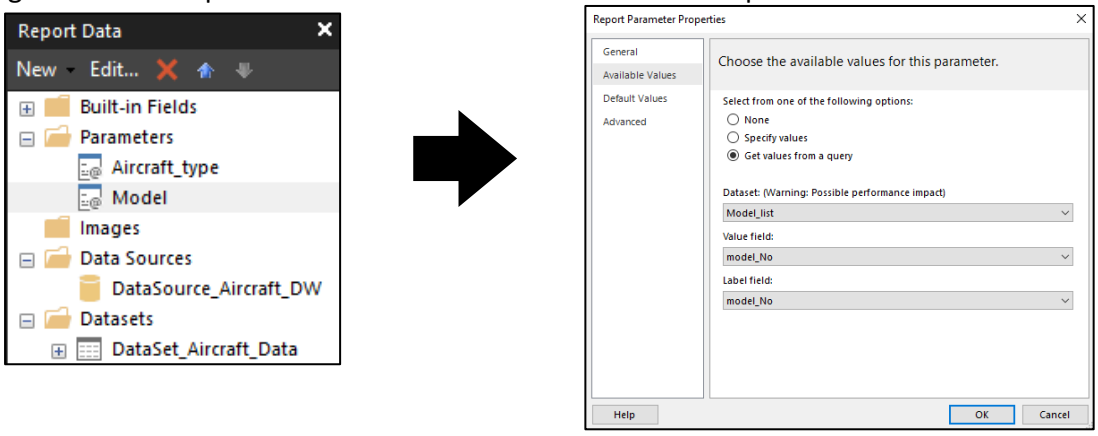
7.9 Click on the Query Designer… → Paste the query we executed for according to my need → we can execute the query using '!' in the query window. After it ran without any issue → Review what is there in other sections Fields, Options, Filters and Parameters → OK

7.10 Right click on the parameter 'Aircraft_type' → select Parameter Properties



7.11 Go to Available Values section → select Get values from a query → select 'Aircrafttype_list' for the Dataset → 'aircraft_type_sk' for the Value field → 'type_name' for the Name field → OK

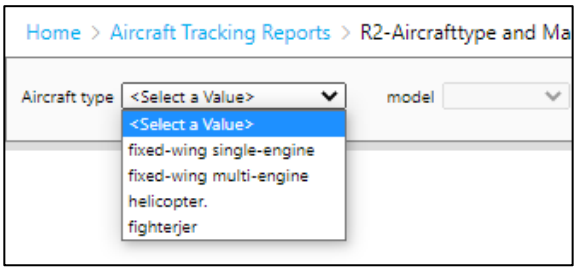
7.12 Right click on the parameter ‘Model’ → select Parameter Properties



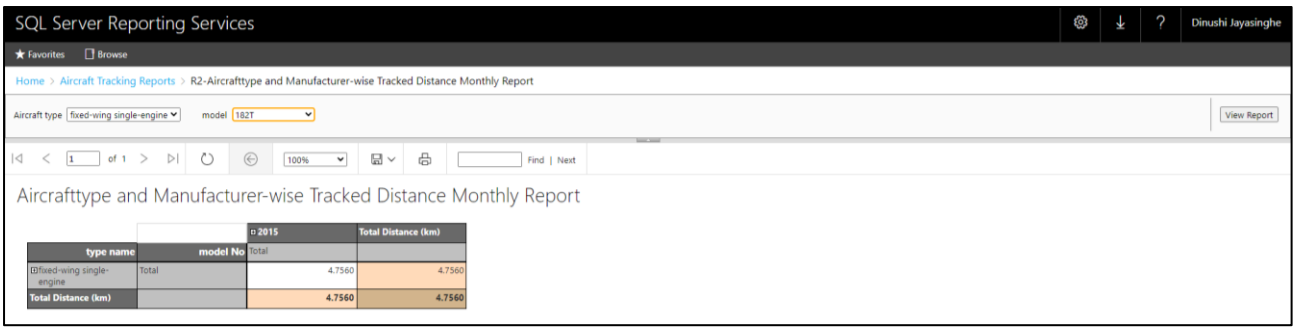
7.13 Go to Available Values section → select Get values from a query → select ‘Model_list’ for the Dataset → ‘model_No’ for the Value field → ‘model_No’ for the Name field → OK

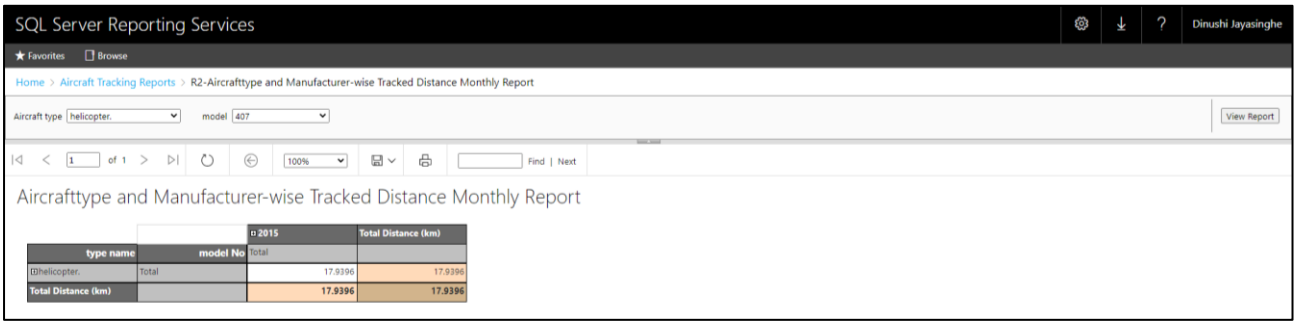
8. Save the report → execute

Then, we can have a report like images given below.



In here Parameters have lists of values and selection of the value of parameter ‘Aircraft type’, will change the list of available values in the parameter ‘model’.



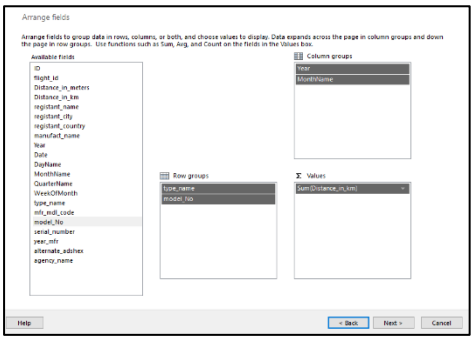


9. Let's create a chart.

9.1 Go to the Insert tab on the ribbon of the Report Builder → select Chart → Chart Wizard...

9.2 Select the 'Dataset_Aircraft_Data' you created as the dataset → Next

9.3 Select the suitable chart → Next → Drag and drop fields like given below → next

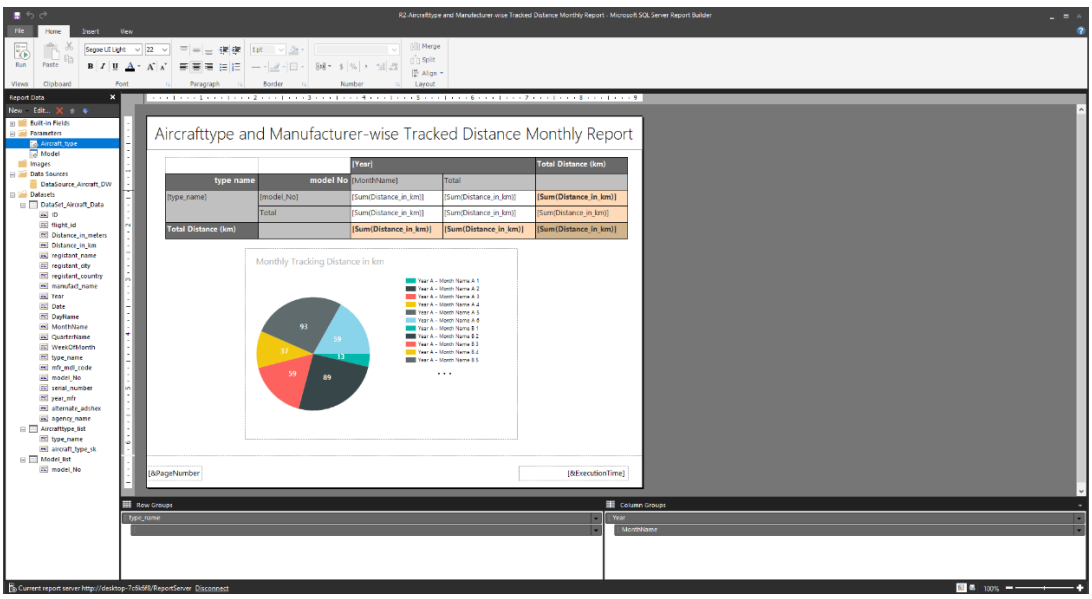


9.4 Review the chart → Finish

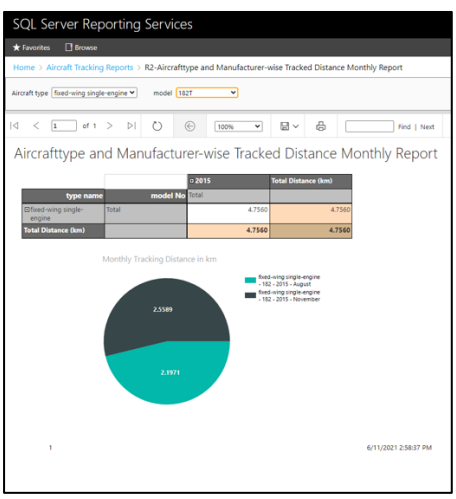
9.5 Then you could able to see the chart

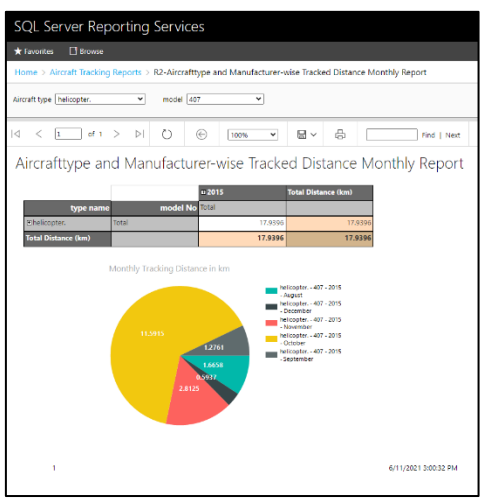
9.6 I have done some modifications to the chart and saved

9.7 Then I could be able to have a chart like given in the image below



10. Save and execute in portal → Then, we can have reports like given below according to the selection



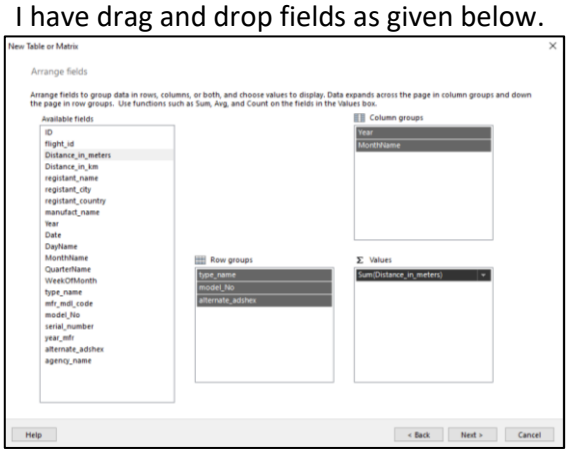


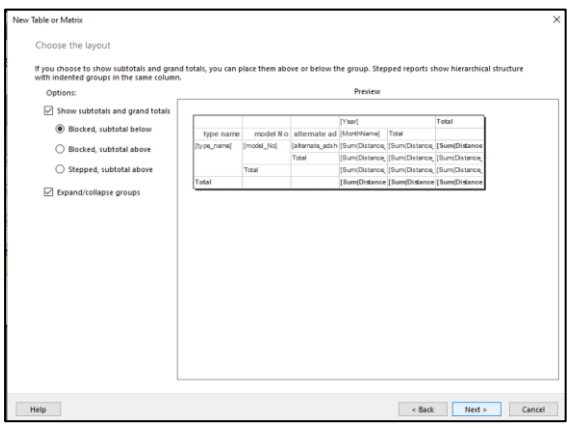
Report 3: SSRS drill-down report

First, we have to followed 4.5.2 steps, then, we can continue with the steps below to create a SSRS drill-down report

1. Go to 'Insert' tab on the ribbon of the Report Builder → select Table → Table Wizard... → to open the New Table or Matrix Wizard
2. Chose the 'DataSet_Aircraft_Data' which was created as the dataset → next
3. At the point of selecting fields for Row groups and Column groups.

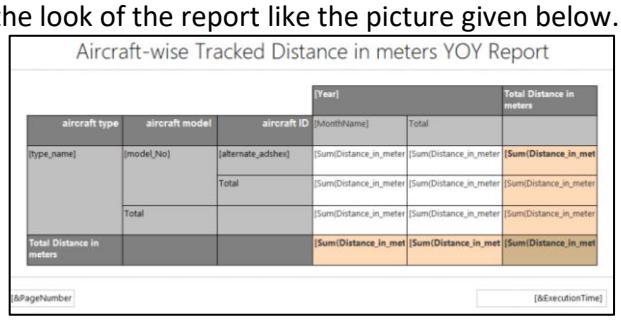
I have drag and drop fields as given below.



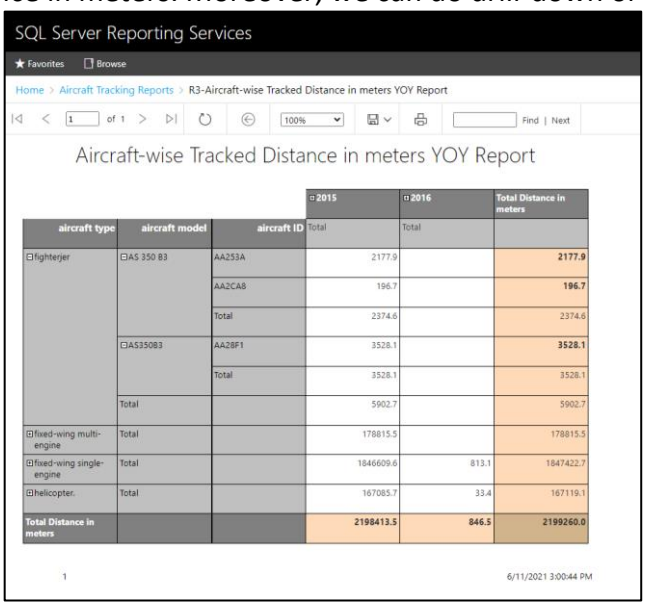


After that you can finished review the rest windows in the wizard.

4. Then, you could be able to see a matrix inserted into the report body. I have provided a suitable report title and design the look of the report like the picture given below.



When we run the report using portal, we can have a report like given below. In here we can see aircraft-wise tracked distance in meters. Moreover, we can do drill-down or roll-up.

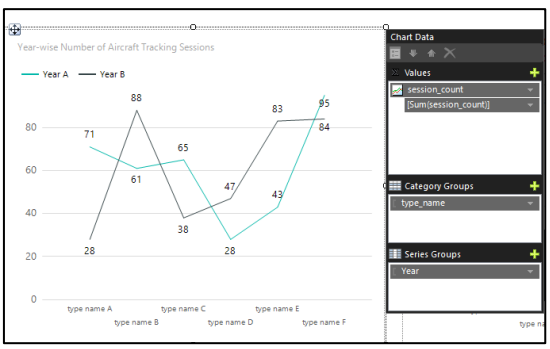


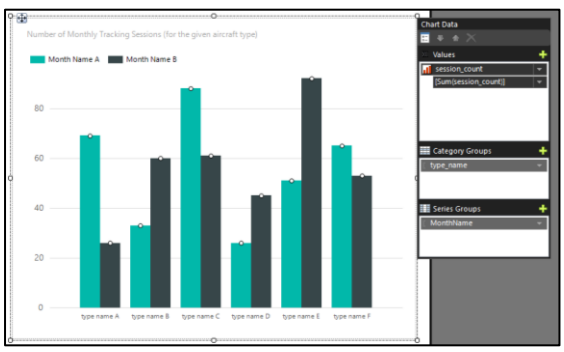
Report 4: SSRS drill-through report

Level 1- Main report

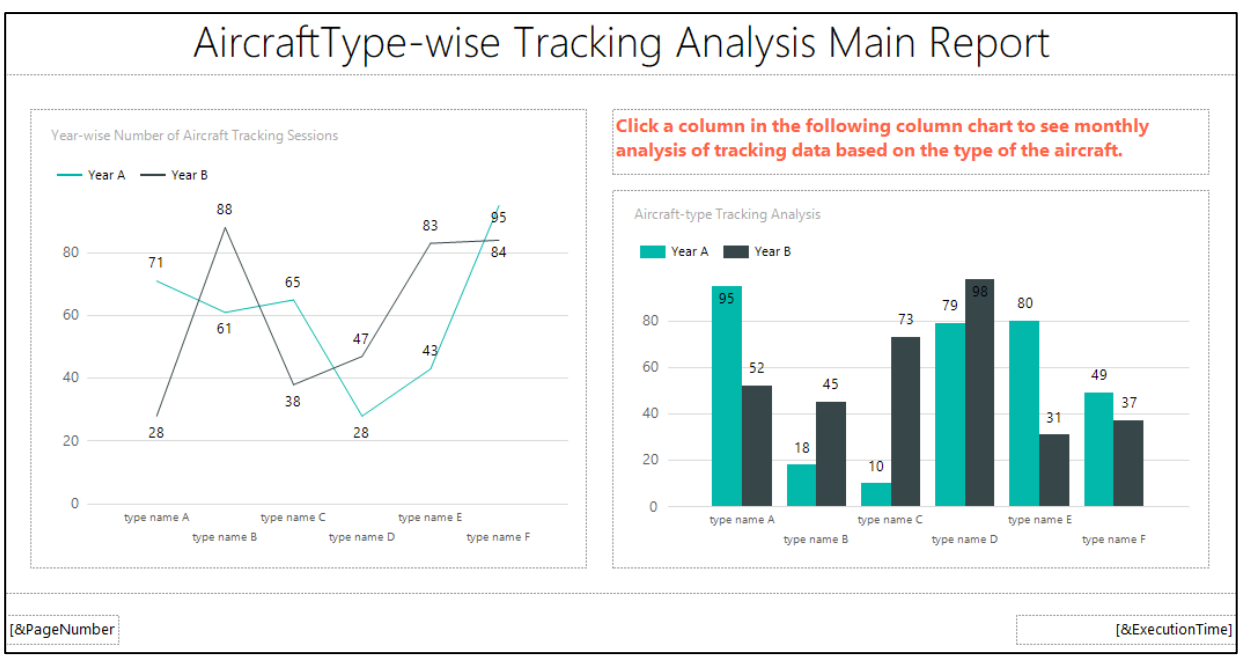
First, we have to followed 4.5.2 steps, then, we can continue with the steps below to create a SSRS drill-through report

1. Then, go to the 'Insert' tab on the ribbon of the Report Builder → select Chart → Chart Wizard...
2. Chose the 'DataSet_Aircraft_Data' you created as the dataset → Next
3. Select Column chart → Next
4. Drag and drop fields given below





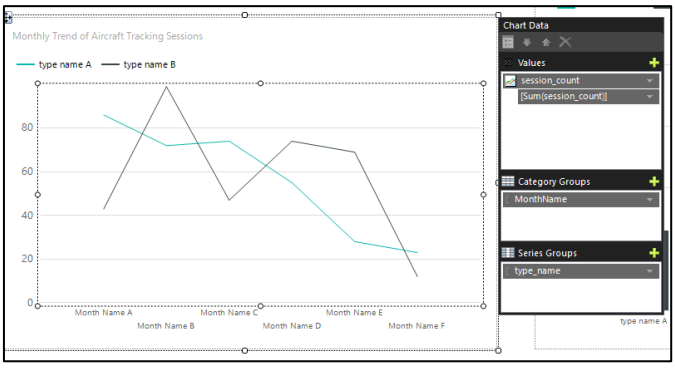
5. After Review the chart → click Finish
6. Then you can see charts like given above
7. After that, Provide a suitable chart title and description

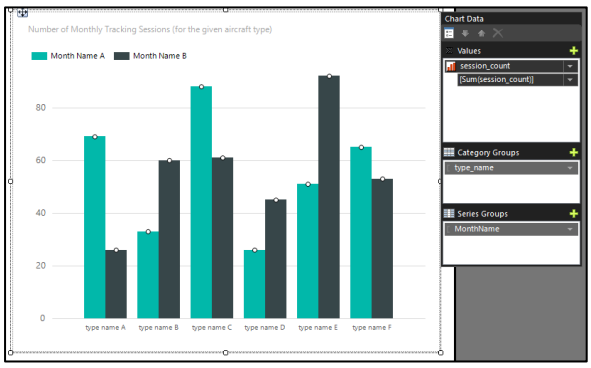


Level 2- Sub report

Then again, we have to followed 4.5.2 steps, and we can continue with the steps given above to create the sub report which is going to connect.

8. again, go to the 'Insert' tab on the ribbon of the Report Builder → select Chart → Chart Wizard...
9. Chose the 'DataSet_Aircraft_Data' you created as the dataset → Next
10. Select Column chart → Next
11. Drag and drop fields given below



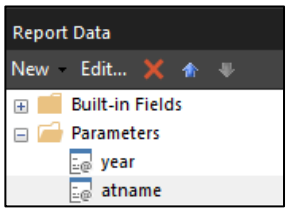


12. After Review the chart → click Finish
13. Then you can see charts like given above
14. After that, Provide a suitable chart title and description.
15. Then, we have to add parameters to the second dataset.
    15.1 We need to add a where' clause to the dataset that we created as 'DataSet_Aircraft_Data'.
    15.2 Right click on the dataset 'DataSet_Aircraft_Data' → select 'Dataset Properties'.
    15.3 Change the query adding the below where clause.
    where dat.type_name = @atname AND dd.Year = @year

Then you can have a query like given below.

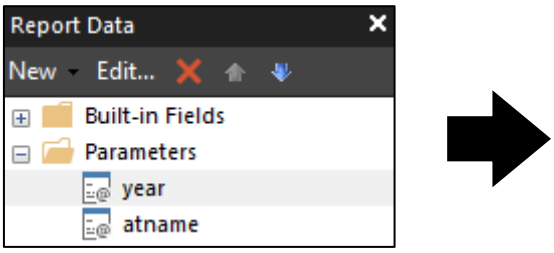
```
select count(fat.flight_id) AS 'session count', fat.[flight_id],fat.[speed]*0.1 as
'Distance_in_meters',fat.[speed]*0.0001 as 'Distance_in_km', dr.[registant_name],dr.city as
'registant_city', dr.country as 'registant_country',
dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name,
dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
from [dbo].[FactAircraftTracking] fat
left outer join [dbo].[DimAircraftData] dad on dad.[aircraft_sk]=fat.[adshex_key]
left outer join [dbo].[DimAgency] da on da.agency_sk=fat.agency_key
left outer join [dbo].[DimAircraftType] dat on dat.aircraft_type_sk = dad.type_key
left outer join [dbo].[DimDate] dd on dd.DateKey = fat.date_key
left outer join [dbo].[DimManufacturer] dm on dm.manufact_sk = dad.manufact_key
left outer join [dbo].[DimRegistant] dr on dr.registant_sk = dad.registant_key
where dat.type_name = @atname AND dd.Year = @year
group by  fat.[flight_id],fat.[speed]*0.1 ,fat.[speed]*0.0001 , dr.[registant_name],dr.city , dr.country,
dm.manufact_name, dd.Year, dd.Date,dd.DayName,dd.MonthName,dd.QuarterName, dd.WeekOfMonth,dat.type_name,
dad.mfr_mdl_code,dad.model_No,dad.serial_number, dad.year_mfr,dad.alternate_adshex,da.agency_name
```

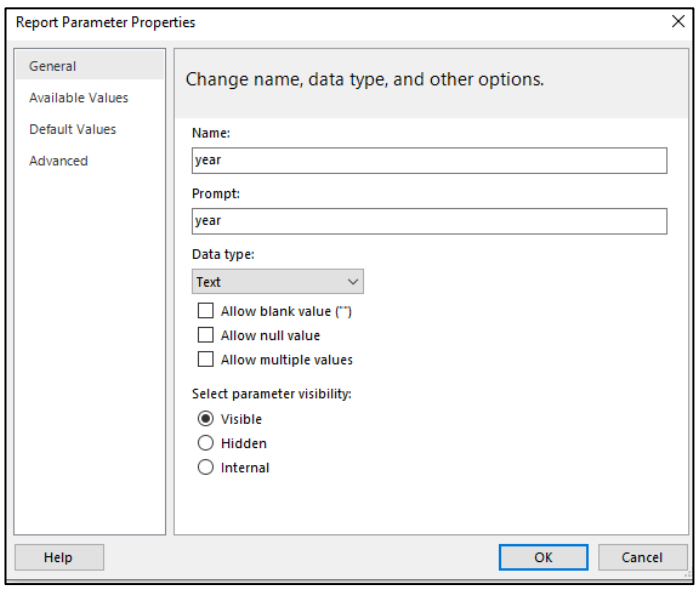
The parameters will be created under Parameters as below



15.4 Right click on the parameter ‘year’ → select Parameter Properties

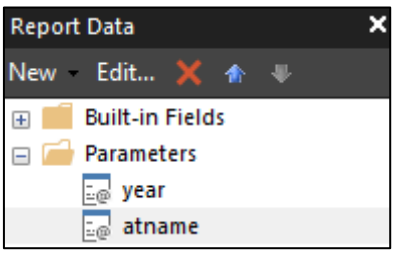
15.5 In General section, Name is ‘year’ and Prompt is also ‘year’

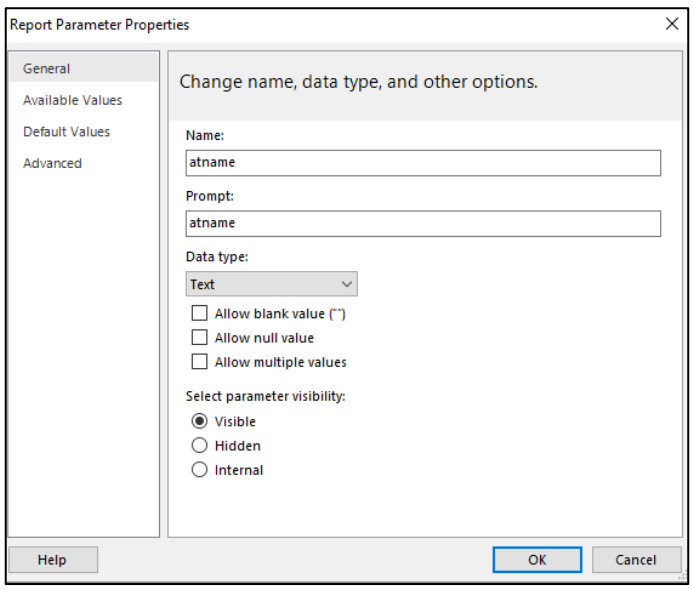




15.6 Right click on the parameter ‘atname’ → select Parameter Properties

15.7 In General section, Name is ‘atname’ and Prompt is also ‘atname’





15.8 Save the report.

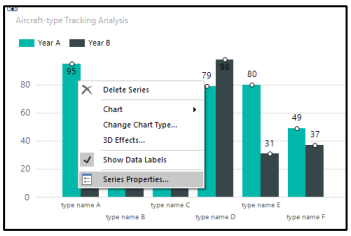
Then, again we have to go to the first report.

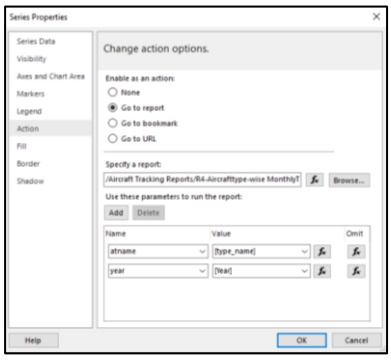
Level 1- Main report Con.

15.9 Right click on any column of the column chart in the main report → select Series Properties…→

15.10 In Series Properties window → go to Action section → select Go to report

15.11 Under, specify a report → select your second level report using the Browse… button → Click on Add button and select 'atname' and 'year' for Name → select '[type_name]' and '[Year]' for Value → OK.

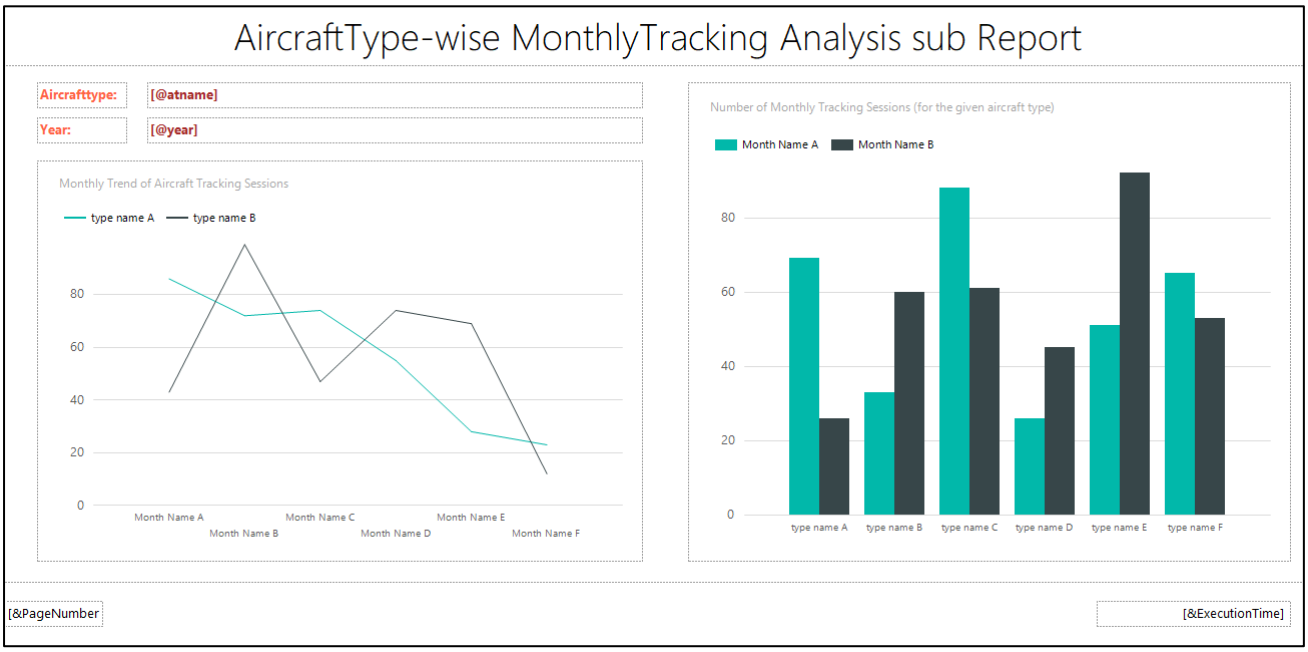




16. Save the report.

Level 2- Sub report Con.

17. Add text box like the image given below to make the report clearer.



18. Save the report

At the end, execute first level report from the SSRS portal

When you take the mouse cursor over any column in either of the charts in the first level report, the cursor should change to ‘hand’, which means it is enabled to be clicked. Once you clicked on a category