Data Analysis in

Bridging Skies: Domestic & International Air Cargo

1.Project Overview

This Project, **"Data Analysis in Bridging Skies: Domestic and International Air Cargo (2022-2025)",** Focuses on analyzing air cargo transportation patterns to identify key trends and insights from domestic and international freight movement data. The analysis aims to understand airline operations, cargo distribution, and the relationship between regions, time, and cargo weight categories.

The Project involves two major phases:

➢ Data Preparation & Cleaning in Excel – Where raw data was refined, formatted, and categorized for analytics.
➢ Data Modelling & Visualization in Power BI – Where insights were derived using DAX formulas, visualization, and an interactive dashboard.

Objective

- To perform end-to-end data preprocessing and transformation using Microsoft Excel.
- To analyze air cargo trends by airline, region, and time period.
- To categorize cargo weights into meaningful tiers for performance evaluation.
- To create an interactive Power BI dashboard showcasing domestic vs international cargo trends.
- To support data-driven decision for logistics optimization and airline cargo management.

2.Date Sources

➢ **Domain:** Transportation Analytics
➢ **Timeline Covered:** From 2022 to 2025 (Activity Period Data)
➢ **Source:** https://catalog.data.gov/dataset/air-traffic-cargo-statistics

3.Problem Statement

With the growing demand for international trade and domestic logistics, analyzing air cargo performance has become crucial for understanding operational efficiency. The project addressed the following analytical challenges:

- o How do domestic and international cargo trends differ across regions?
- o Which airline handle the highest cargo volumes?
- o What patterns can be observed in cargo weight distribution by category and region?
- o How can categorized cargo tiers (in TONS and pounds) reveal logistics patterns over time?
- o What seasonal or monthly variation exist in cargo weight distribution?

This study aims to bridge the gap between raw aviation cargo data and actionable business insights through effective visualization and analysis.

4.Attribute (Column / Feature) Details

Column Name	Data Type	Description
Activity Period	Number	The year and month when this activity occurred
Activity Period Start Date	Date (dd-mmm-yyyy)	Start date of the year and month when this activity occurred
Operating Airline	General	Airline name for the operator of aircraft with cargo activity
Operating Airline IATA Code	General	The international Air Transport Association (IATA) two-letter designation for the Operating Airline
Published Airline	General	Airline name that issues the ticket and books revenue for cargo activity
Published Airline IATA Code	General	The International Air Transport Association (IATA) two letter designation for the Published Airline

GEO Summary	Text	An airport-defined high-level geographical categorization of the flight operations
GEO Region	Text	An airport-defined world region of the flight operations
Activity Type Code	Text	Short code that represents the type of activities such as enplaned, deplaned, and transit
Cargo Type Code	Text	Short code that represents a broad categorization of the type of cargo such as "mail"
Cargo Aircraft Type	Text	Short code that represents the type of cargo aircraft
Cargo Weight LBS	Number	The weight (in pounds) of air cargo associated with General and Cargo Statistics attribute fields
Cargo Metric TONS	Number	The weight (in metric tons) of air cargo associated with General and Cargo Statistics attribute fields
Cargo Weight Category by TONS	Text	Derived category based on cargo weight in tons (Light, Moderate, Heavy, Ultra)
Cargo Weight Category by LBS	General	Derived tier category based on cargo weight in pounds (Tier 1-4)

5. Tools & Technologies

- **Microsoft Excel**
  - ✓ Data Cleaning
  - ✓ Missing Value Handling
  - ✓ Calculated Column Created
  - ✓ Data Type Formatting

- **Microsoft Power BI**
  - ✓ Data Loading and Modelling
  - ✓ DAX Calculation and Measures
  - ✓ Interactive Dashboard Creation
  - ✓ Visualization and Insight Derivation

6.Data Pre-Processing (Excel / Power Query)

Task Performed:

1. **Data**

   Created and named the main table as "Air Cargo" for consistency and easy reference.

2. **Handling Missing Values**

   Identify two missing values:
   - Operating Airline IATA Code
   - Published Airline IATA Code

   ➢ Replace both with "NA" to maintain dataset completeness.

3. **Column Create**
   - Created "Cargo Weight Category by TONS" based on cargo metric TONS:
     - 1 – 500 → Light Cargo
     - 501 – 2000 → Moderate Cargo
     - 2001 – 4000 → Heavy Cargo
     - 4001 and above → Ultra Cargo
   - Created "Cargo Weight Category by LBS" based on cargo weight LBS:
     - 0 – 5,00,000 → Tier 1
     - 5,00,001 – 20,00,000 → Tier 2
     - 20,00,001 – 60,00,001 → Tier 3
     - 60,00,001 and above → Tier 4

4. **Removed Column**

   Removed irrelevant column
   - Date as of
   - Date load at

5. **Data Type Formatting**
   - Numeric: Activity Period, Cargo Weight LBS, Cargo Metric TONS
   - Date: Activity Period Start Date (Custom Format – dd-mmm-yyyy)
   - Text: GEO Summary, GEO Region, Activity Type Code, Cargo Type Code, Cargo Aircraft Type, Cargo Weight Category by TONS
   - General: All other columns

6. **File Storage**

   Saved the cleaned dataset as "Air Traffic Cargo Statistics" for Power BI import.

7.Data Modelling and DAX (Power BI)

Data Model

- o Imported cleaned Excel dataset into Power BI.
- o Created a **Measure Table** to store calculated metrics.
- o Established logical relationship among activity type, region, and cargo weight.

Key DAX Measures Used

- Calculates the total number of records using "COUNTROWS"
- Determines the number if unique Published Airlines based on Published Airline IATA Code column using "DISTINCTCOUNT"
- Computes the count of distinct operating airline through "DISTINCTCOUNT"
- Returns the distinct count of cargo weight categories measured in tons using "DISTINCTCOUNT" (Cargo Metric TONS)
- Returns the distinct count of cargo weight categories measured in pounds using "DISTINCTCOUNT" (Cargo Weight LBS)

8.Analysis and Visualizations (Power BI)

Dashboard Components and Design

A clean, aviation-themed dashboard background with an airplane image was used for thematic visualization. The layout was interactive, with filters and drill-down capabilities.
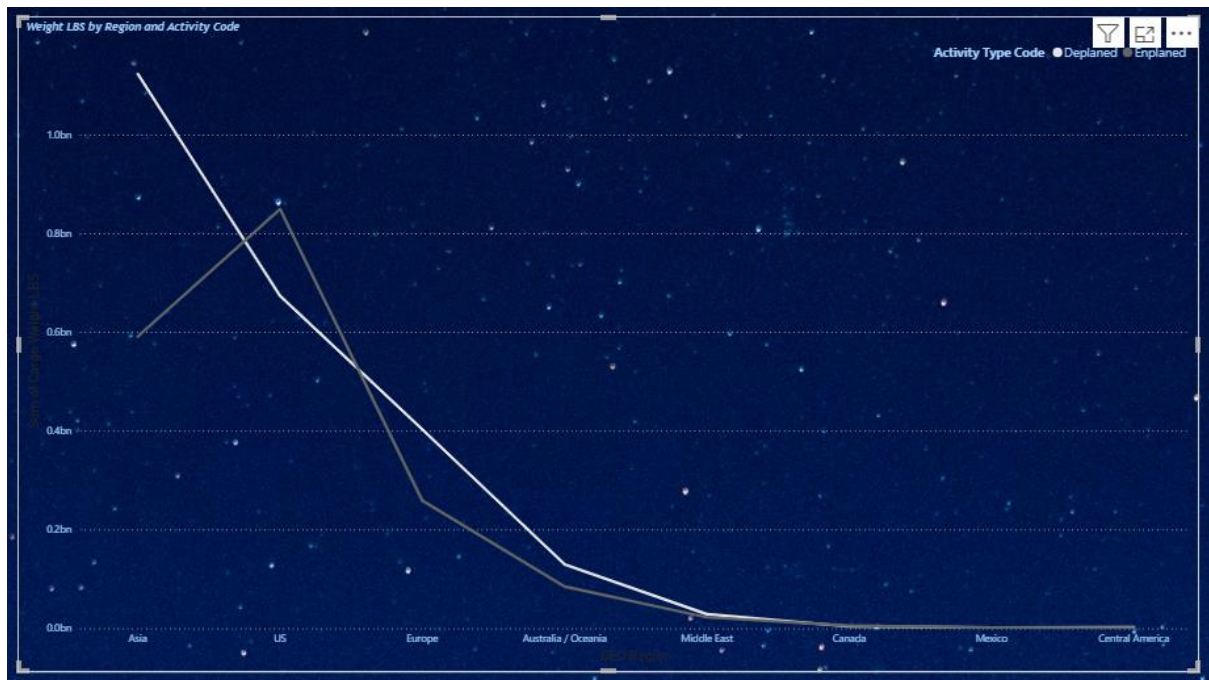
Visual Implemented

1. **Card Visual**
   Displayed key KPIs
   - ✓ Total Rows
   - ✓ Published Airline Count
   - ✓ Operating Airline Count
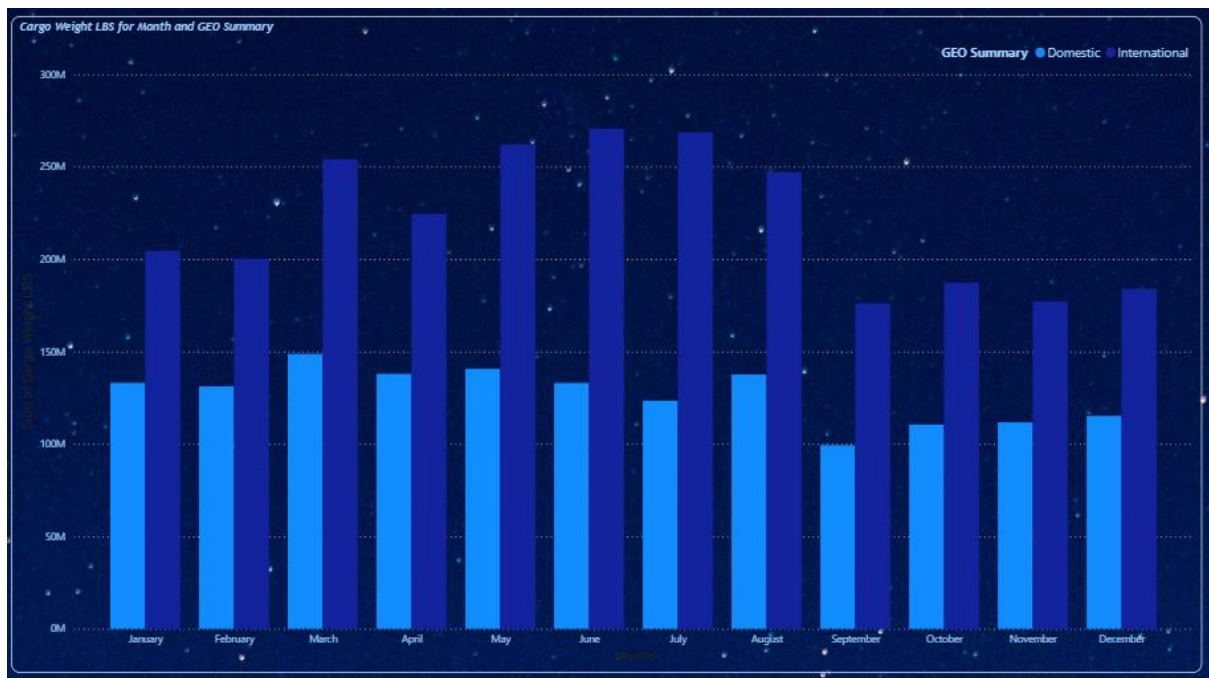
2. Line Chart

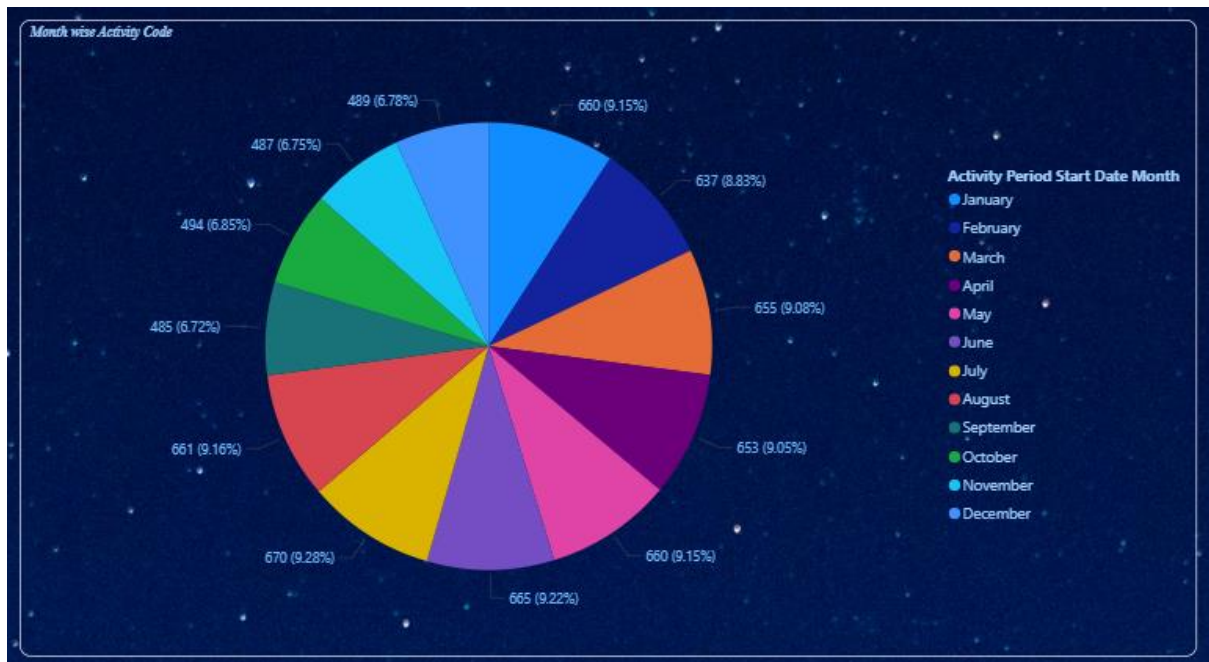✓ Showed Cargo Weight LBS across regions, categories by Activity Type

3. Clustered Column

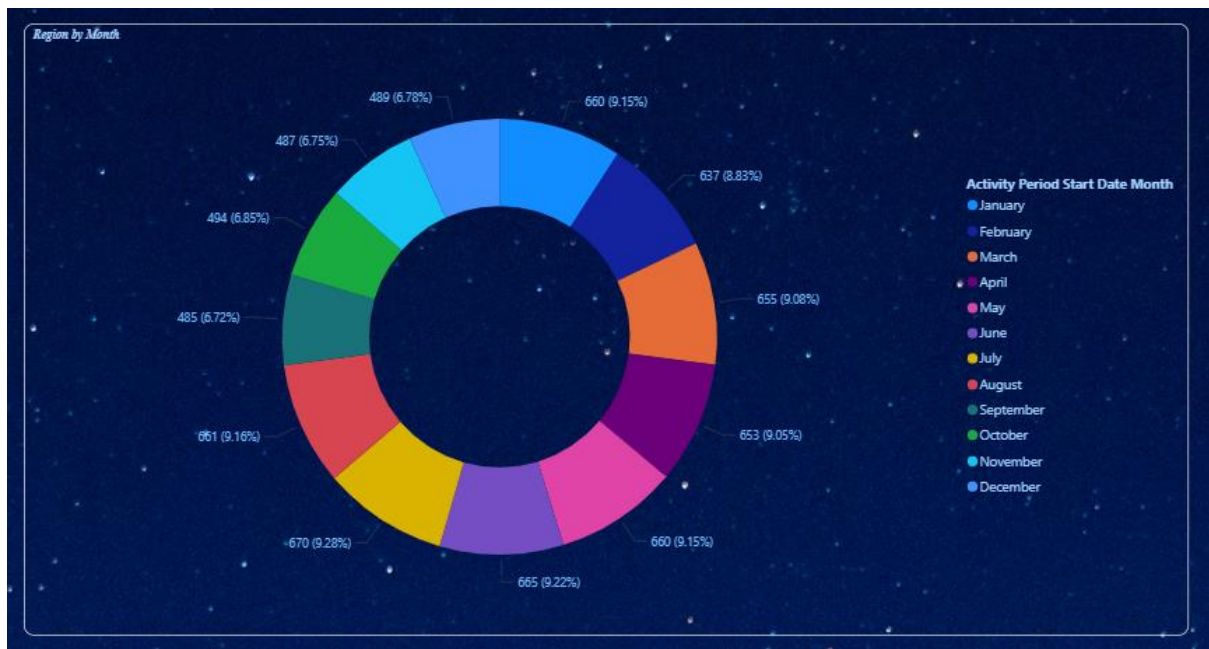✓ Displayed month wise Cargo Weight LBS trend by GEO Summary

4. Pie Chart

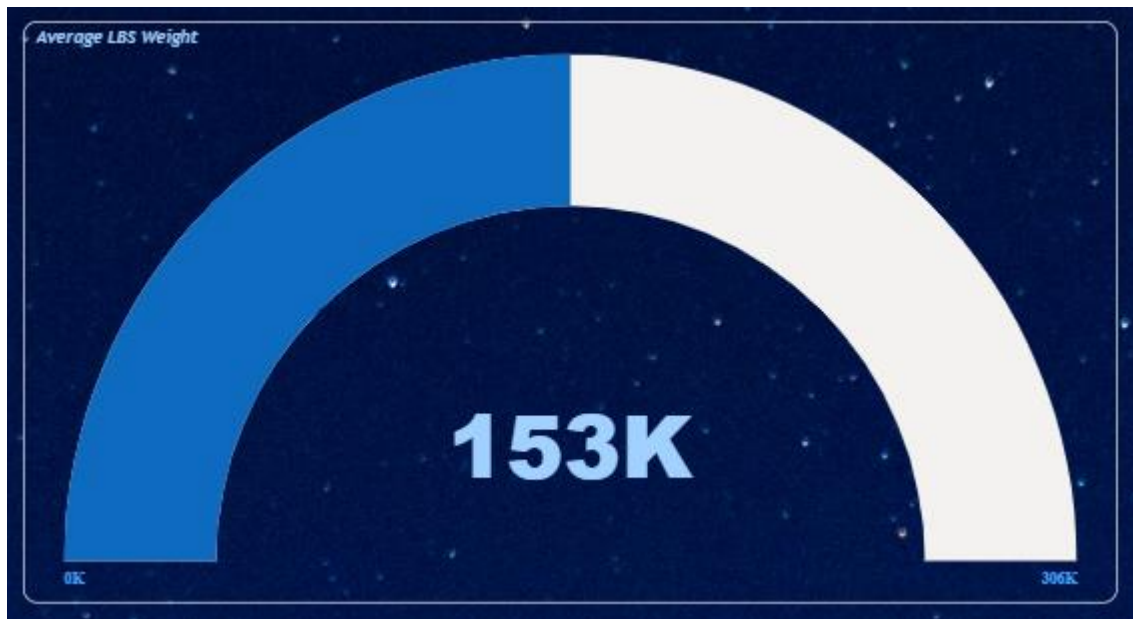✓ Showed monthly distribution of Activity Type Codes

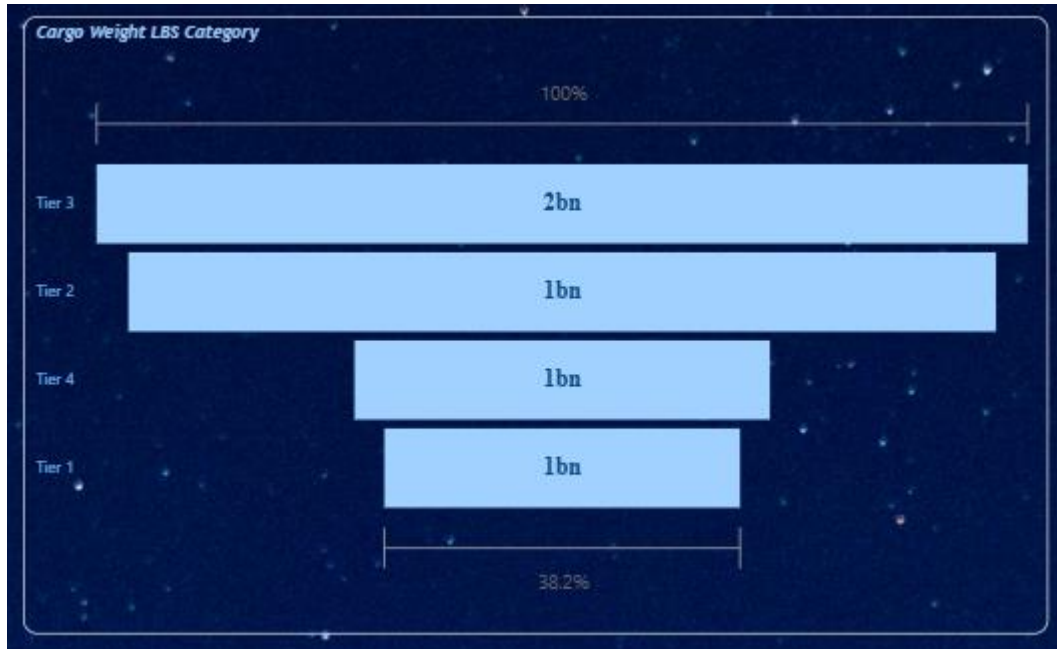## 5. Donut Chart

✓ Illustrated GEO Region count per month

6. Gauge Chart

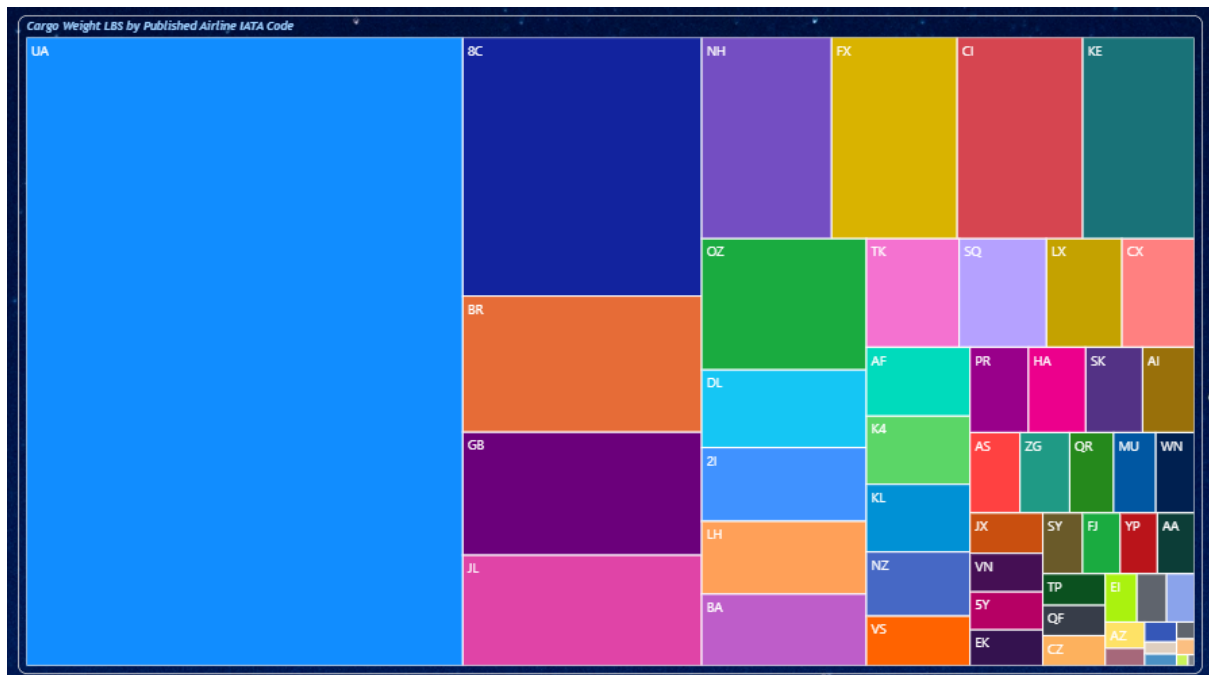✓ Showed Average Cargo Metric TONS

7. Funnel Chart

✓ Represented Cargo Weight LBS distribution by Tier Categories

8. Treemap

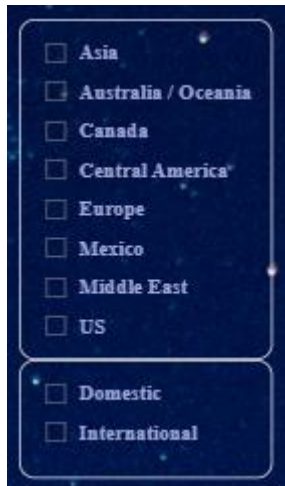✓ Visualized Cargo Weight LBS by Published Airline IATA Code

9. Map Visualization

✓ Mapped Cargo Metric TONS by GEO Summary using bubble size

Interactivity Features

- ➢ Filters for GEO Summary (Domestic vs International)
- ➢ Region-based drill-down


9.Insights & Conclusions

Key Insights

- **Highest Cargo Volume Regions**: Asia, Europe, and the US dominated total cargo weight in both domestic and international segments.
- **Airline Performance**: Around 57 published airline and 60 operating airlines were active, indicating strong operational diversity.
- **Cargo Weight Patterns**: Tier 3 and Tier 4 categories (above 2 million LBS) handled most of the cargo, reflecting heavy and ultra-heavy cargo dominance.
- **Activity Type Trends**: Enplaned (outgoing) cargo volumes often exceeded deplaned (incoming) in certain months, suggesting trade surpluses in those regions.
- **Seasonal Peaks**: Mid-year months (April-August) showed higher cargo movement, aligning with global trade cycles.
- **Domestic vs International**: Domestic cargo showed consistent weight, while international trends fluctuate sharply, influenced by region and airline capacity.

Final Dashboard
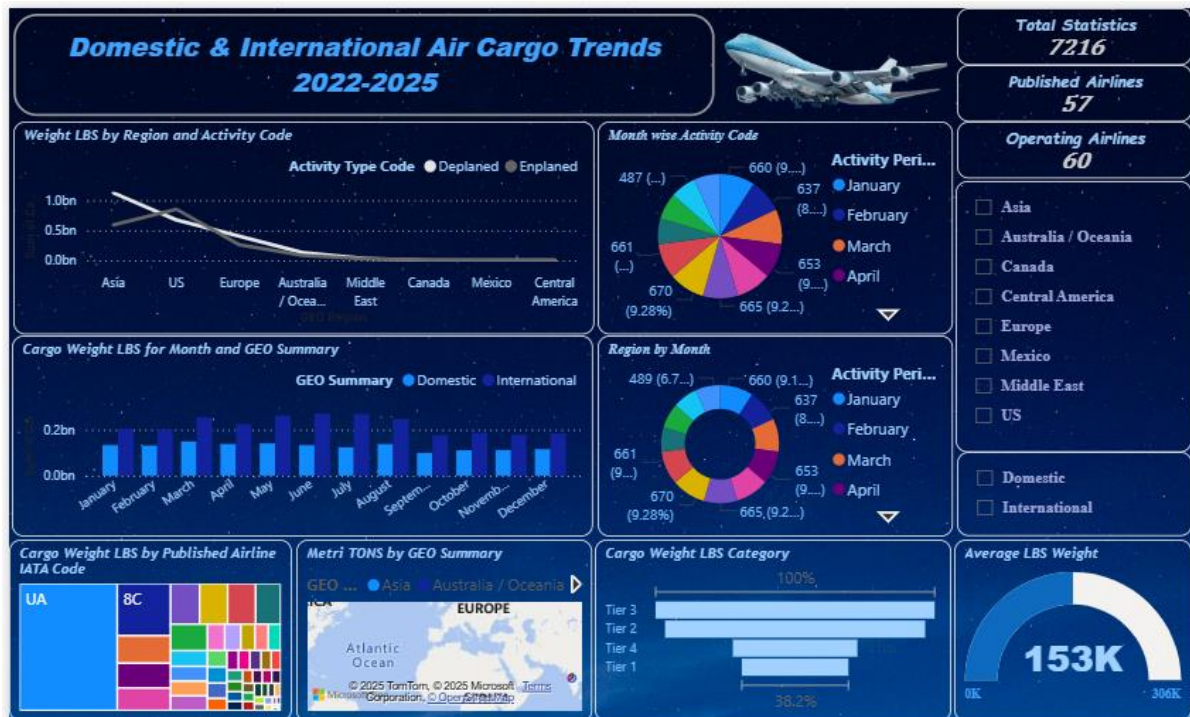
Analytical Perspective

- o **Descriptive:** Described overall cargo volumes and airline participation.
- o **Diagnostic:** Identified reasons behind regional or seasonal variations.
- o **Predictive:** Predicated that Asia- US routes would continue to lead in heavy cargo segments.
- O **Prescriptive:** Suggested focusing resources on Tier 3 & tier 4 cargo operations for profitability optimization

10.Conclusion

The project successfully demonstrates the **end-to-end data analytics lifecycle** – from cleaning and transforming aviation cargo data in Excel to creating an insightful Power BI dashboard. By combining **data preparation, modelling,** and **visual storytelling,** the project provides an analytical bridge connecting raw data to strategic insights.

The **"Bridging Skies" Dashboard** offers a clear visualization of global air cargo trends, airline performance, and cargo category analysis, supporting aviation authorities and logistics managers in making informed operational decisions.