Data Warehouse Project

The data model design chosen for this airline case study follows the **Dimensional Modeling** approach, which is well-suited for decision support and data analysis. This design is based on the **Star Schema**, with a central fact table surrounded by dimension tables. The purpose of this approach is to organize the data for easy querying and analysis by executives, managers, and business analysts.

**Fact Table: Fact\_Flight\_Table**

**Purpose:**  
This is the central table in the star schema. It stores the measurements and facts related to flight activity, such as flight details, passenger activities, fare amounts, miles and responses to promotions. This is the table where the actual numeric data resides, and it's typically used for aggregation and reporting.

**Columns**

1. **Fact\_Flight\_ID (Primary Key)**:
   * Unique identifier for each record in the fact table. Ensures each transaction or activity is distinct.
2. **Flight\_ID (Foreign Key)**:
   * Links to the **Dim\_Flight** table to provide details about the flight (e.g., flight number, airline, aircraft type, etc.).
3. **Frequent\_Flyer\_ID (Foreign Key)**:
   * Links to the **Dim\_Frequent\_Flyer** table, providing information about the frequent flyer associated with the flight (e.g., their name, membership tier, and miles accrued).
4. **Customer\_Care\_ID (Foreign Key)**:
   * Links to the **Dim\_Customer\_Care** table to capture interactions like inquiries, complaints, and feedback, allowing analysis of customer service performance.
5. **Reservation\_ID (Foreign Key)**:
   * Links to the **Dim\_Reservation** table, providing details on how the reservation was made, its status, and payment method.
6. **Date\_ID (Foreign Key)**:
   * Links to the **Dim\_Date** table, enabling time-based analysis (e.g., trends by year, quarter, or month).
7. **Fare\_Basis (Foreign Key)**:
   * Links to the **Dim\_Fare** table, providing insights into fare types, amounts, and class of service.
8. **Number\_of\_Passengers**:
   * Represents the number of passengers booked under the reservation. Useful for revenue and capacity analysis.
9. **Price**:
   * The price paid for the reservation. Helps in revenue analysis and fare comparisons.
10. **Total\_Miles**:
    * The total frequent flyer miles accrued during the flight. Relevant for loyalty program analysis.
11. **Interaction\_Type**:
    * The type of customer care interaction (e.g., Inquiry, Complaint, Feedback). Tracks the nature of customer interactions.
12. **Problem\_Severity**:
    * Severity level of any reported issue (e.g., High, Medium, Low). Helps prioritize problem resolution.
13. **Response\_Time**:
    * The time taken to resolve customer issues. A performance metric for customer care efficiency.
14. **Reservation\_Status**:
    * The current status of the reservation (e.g., Confirmed, Cancelled, Pending). Useful for operational and revenue analysis.
15. **Payment\_Method**:
    * Indicates how the payment was made (e.g., Credit Card, Points, PayPal). Helps analyze customer payment preferences.
16. **Frequent\_Flyer\_Status**:
    * The membership tier of the frequent flyer (e.g., Gold, Platinum, Aluminum). Useful for customer segmentation.
17. **Ticket\_Class**:
    * The class of the ticket booked (e.g., Economy, Business, First). Tracks customer preferences by service level.
18. **Flight\_Status**:
    * The operational status of the flight (e.g., On-Time, Delayed, Cancelled). Helps in performance and reliability analysis.
19. **Flight\_Duration**:
    * The duration of the flight in minutes or hours. Useful for analyzing route efficiency.
20. **Flight\_Source**:
    * The origin airport or city of the flight. Allows geographic analysis of customer travel patterns.
21. **Flight\_Destination**:
    * The destination airport or city of the flight. Enables analysis of popular destinations and route profitability.
22. **Upgrade\_Flag**:
    * Boolean value indicating whether a passenger upgraded their ticket (e.g., Economy to Business). Helps understand customer willingness to pay for better services.
23. **Overnight\_Stay**:
    * Number of nights spent at the destination. Helps analyze travel patterns and overnight stay behavior.
24. **Response\_To\_Promotion**:
    * Boolean value indicating whether the reservation was influenced by a promotion. Useful for marketing campaign effectiveness analysis.

**2. Dimension Table: Dim\_Frequent\_Flyer**

**Purpose:**  
This table stores details about the frequent flyer. It is used to categorize and filter flight activity based on specific attributes of the passenger, such as their loyalty status, region, and total miles.

**Key Columns:**

* **Frequent\_Flyer\_ID**: A unique identifier for each frequent flyer.
* **Name**, **Age**, **Gender**: Personal details about the frequent flyer.
* **Status**: The frequent flyer status (e.g., Gold, Platinum, etc.).
* **Membership\_Since**: The date when the flyer became a member.
* **Total\_Miles**: The total miles accumulated by the flyer.
* **Frequent\_Flyer\_Segment**: Segmentation like business, leisure, etc.
* **Country**, **Email**: Contact and demographic information.

**Why This Dimension Table:**  
This allows analysts to understand the behaviors and demographics of frequent flyers. Marketing and customer retention teams would use this data to target specific groups based on loyalty status, miles accumulated, or membership tenure.

**3. Dimension Table: Dim\_Flight**

**Purpose:**  
This table stores details about the flight itself, such as flight number, airline, and origin/destination cities. This enables analysis based on the operational aspects of the flights.

**Key Columns:**

* **Flight\_ID**: A unique identifier for each flight.
* **Flight\_Number**, **Airline\_Name**: Identifying information for the flight.
* **Flight\_Source**, **Flight\_Destination**: The airports served by the flight.
* **Flight\_Date**: The specific date of the flight.
* **Flight\_Duration**: The duration of the flight.
* **Aircraft\_Type**: The type of aircraft used for the flight.

**Why This Dimension Table:**  
This allows the company to analyze flight routes, airlines, and specific flight data. This dimension enables more granular analysis of the flight data, such as tracking the performance of certain routes, aircraft types, and times of travel.

**4. Dimension Table: Dim\_Reservation**

**Purpose:**  
This table stores details about the reservation itself, such as how the reservation was made, the payment method, and the status of the ticket. This allows analysis of how reservations are made and the financial side of the airline's operations.

**Key Columns:**

* **Reservation\_ID**: A unique identifier for the reservation.
* **Reservation\_Channel**: The method through which the reservation was made.
* **Booking\_Date**, **Ticket\_Class**, **Reservation\_Status**: Additional details about the reservation.
* **Payment\_Method**: The payment method used for booking the flight.

**Why This Dimension Table:**  
This is important for finance teams to analyze the company's revenue streams, how customers book flights, and which payment methods are most common. It also helps with profitability analysis based on reservation type.

**5. Dimension Table: Dim\_Customer\_Care**

**Purpose:**  
This table stores information about the customer care interactions, capturing the nature of customer inquiries, complaints, feedback, and issue resolution.

**Key Columns:**

* **Customer\_Care\_ID**: A unique identifier for the customer care interaction.
* **Interaction\_Type**: The type of interaction (e.g., inquiry, complaint, feedback).
* **Problem\_Severity**: Severity of any issues raised (if applicable).
* **Feedback\_Date**: The date when the customer care interaction occurred.
* **Resolution\_Status**: The status of resolving the issue.
* **Response\_Time**: How quickly the company responded to the customer.
* **Channel**: The communication channel used for the interaction (e.g., phone, email).

**Why This Dimension Table:**  
This helps to analyze customer service data, measure how well the company handles customer feedback, and resolve complaints. This data is critical for the airline’s efforts to improve customer satisfaction and refine its services.

**6. Dimension Table: Dim\_Fare**

**Purpose:**  
This table stores information about fare types, which allows the company to analyze pricing trends and how different fare structures impact revenue and customer behavior.

**Key Columns:**

* **Fare\_Basis**: A unique identifier for the fare rules.
* **Fare\_Type**: The category of fare (e.g., regular, promotional).
* **Price**: The price associated with the fare.
* **Class\_of\_Service**: The service class (e.g., first class, economy).
* **Seasonality**: The seasonal nature of the fare.

**Why This Dimension Table:**  
This allows financial and marketing teams to analyze which fare types are most popular and how they affect profitability, as well as understanding the impact of promotional pricing.