Air Hub: Database Management System for Airplane Conveyance

Project Overview:

Our project aims to create a robust database management system for an airline transportation management system. This centralized database will serve as a foundation to efficiently store, organize, manage, and uphold all data linked to the airline's operations. The encompassed information will span across vital details regarding flight schedules, passenger information, ticketing, aircraft specifics, and crew member details.

Business Problems Addressed:

Through this advanced database system, we intend to tackle the following business challenges:

- Integrate all airline-related data into a singular repository, facilitating easy access for both staff and passengers.

- Aid airline staff in adhering to schedules, ensuring timely departures and arrivals. The system will also present user-friendly structures for better passenger engagement, enhancing overall commuter experience.

- Provide access to both historical and current data, enabling the extraction of meaningful insights related to customer usage patterns, flight performance, and staff evaluations. This data-driven approach will inform decision-making processes.

- Prioritize the protection of user and travel-related data. Implement robust security measures to ensure the confidentiality and integrity of sensitive information.

- Construct a flexible system capable of accommodating the evolving dynamics of the airline industry and the city it serves.

- Implement an automated, paperless billing system to mediate cost-effective rides for passengers while streamlining financial operations for the company.

Entities:

Sr No.	Entities	Description
1	Aircraft	Contains information on aircraft, including a unique identification number Aircraft ID, model, seating capacity, date of last maintenance and manufacturer.
2	Airport	Contains details about airports, with a unique identification number Airport ID, name, location, capacity, and information of runway.
3	Crew Member	Holds information on crew members, featuring unique identification number Crew Member ID (primary key), name, role, Flight ID (foreign key)
4	Flight	Represents information about flights, including a unique identification number Flight ID (primary key), Aircraft ID (foreign key), origin and destination, route, status
5	Flight Schedule	Contains data about flight schedules, featuring a unique identification number Schedule ID (primary key), Flight ID (foreign key), departure and arrival times, date.
6	Maintenance Record	Records maintenance activities for aircraft, with a unique identification number Record ID (primary key), aircraft ID (foreign key), maintenance date, and details of the maintenance.
7	Passenger	Stores details about passengers, including a unique identification number Passenger ID (primary key), name, contact information, and passport number.
8	Ticket	Contains information about tickets, featuring a unique identification number Ticket ID (primary key), Flight ID (foreign key), Passenger ID (foreign key) and ticket information
9	User Account	Holds information about user accounts, including a unique identification number User ID (primary), name, email (unique), password.
10	Booking	Represents information about passenger bookings, including a unique identification number Booking ID (primary key), passenger ID (foreign key), flight ID (foreign key), date and payment status.
11	Baggage	Contains information related to passenger baggage information which includes Baggage ID (primary key), Aircraft ID (foreign key), and baggage weight and dimensions.

Cardinalities:

From	To	Cardinality
Airport	Flight Schedule	Optional One to Many
Flight Schedule	Flight	One to One
Airport	Flight Schedule	Many to One
Aircraft	Maintenance Record	Optional One to Many
Booking	Ticket	One to Many
Passenger	Booking	Optional One to Many
User Account	Passenger	Optional One to Many
Ticket	User Account	One to One
Ticket	Passenger	One to One
Booking	Flight	One to Many
Flight	Booking	One to Many

Business Rules:

1. An airport may have multiple flight schedules, but there is only one flight schedule for an airport.

2. Each flight schedule is associated with one and only one flight, and each flight is associated with one flight schedule.

3. Multiple flight schedules can belong to one airport.

4. An aircraft may have multiple maintenance records, but maintenance records are not mandatory for every aircraft.

5. Each booking can have multiple tickets associated with it, but there is mandatory one booking for a ticket.

6. A passenger may or may not have multiple bookings.

7. Each user account may or may not be associated with multiple passengers, but a passenger can have only one user account.

8. Each ticket is associated with one user account, and each user account is associated with one or many tickets.

10. Each booking is associated with multiple flights and one flight can have multiple bookings.

11. Each flight can have multiple baggage's, but each baggage is associated to mandatory one aircraft.

Design Decisions:

Following are the entities mentioned in the ER diagram, the details, their relations and the reason of inclusion in our system:

1.**Aircraft:**
Aircraft is a central entity in the system, representing individual airplanes. It is strongly connected to flights, providing crucial details about the model, seating capacity, last maintenance date, and manufacturer. This entity allows for efficient tracking and management of specific aircraft within the airline.

2. **Airport:**
Airport is a fundamental entity, providing comprehensive information about airports. It includes details such as name, location, capacity, and runway information. This entity plays a vital role in organizing flight schedules and managing flights based on departure and arrival locations.

3. **Crew Member:**
Crew Member is a key entity that stores essential information about crew members, including their role, certification date, and hours flown. It is connected to flights, enabling efficient management of crew assignments and tracking crew details throughout their engagements.

4. **Flight:**
Flight is a core entity representing individual flights. It contains critical information such as origin, destination, route, and status. This entity is strongly connected to both Aircraft and Flight Schedule, serving as a central point for managing flight details and operations.

5. **Flight Schedule:**
Flight Schedule is pivotal for managing flight timing and connecting flights with specific airports. It contains details about departure and arrival times, associated with a unique Schedule ID. This entity plays a crucial role in organizing and optimizing flight schedules.

6. **Maintenance Record:**
Maintenance Record is a vital entity recording maintenance activities for aircraft. It includes details such as maintenance date and specific details of the maintenance. This entity ensures the systematic tracking of aircraft maintenance history, contributing to operational safety.

7. **Passenger:**
Passenger is a key entity that stores details about individuals using the airline services. It includes information such as name, contact details, and passport number. Connected to both Ticket and Booking, this entity is crucial for managing passenger information and their interactions with the airline.

8. **Ticket:**
Ticket is a central entity strongly related to both passengers and flights. It represents the unique ticket associated with a specific passenger and route. Passengers purchase tickets based on their chosen routes, and each route has a distinctly identified ticket. This entity facilitates tracking passenger journeys, collecting feedback, and managing the financial aspects of the business.

9. **User Account:**
User Account is a crucial entity for managing user authentication and passenger accounts. It includes details such as name, email (unique), and password. This entity is connected to the Passenger entity, providing a secure and personalized user experience for passengers.

10. **Booking:**
 Booking is a core entity representing passenger bookings. It includes details such as date, payment status, and is connected to both Passenger and Flight. This entity serves as a central point for managing and tracking passenger bookings, connecting passengers with specific flights.

11. **Baggage:**
 Baggage is an essential entity associated with passenger travel. It represents individual baggage items, each connected to a specific flight. This entity plays a crucial role in tracking passengers' baggage throughout their journey, ensuring proper handling and contributing to a seamless travel experience.