**Airline Reservation Database Design Document**

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## Database Purpose

The purpose of the database is to maintain the data used to search all airline flights information, purchase or cancel tickets and check order status. It also can be used by administrative staff only to browse all users’ information and travel history. This database is designed for a travel agent use.

## Business Problems Addressed

* Allow customers to search and compare different airline flights information.
* Provide customers access to purchase, cancel tickets and check their order status.
* Allow administrative staff to maintain the customer information.
* Permit administrative staff to update flight information in time (e.g., when any flight gets delayed or canceled, they can send notifications to customers immediately).
* Supply insight for administrative staff to analysis flight marketing initiatives (e.g., generate information from history data to help administrative staff learn which is the popular season and what type of customers they have).
* Permit administrative staff knowledge the income and analyze their profit.

## Assumptions/Constraints/Risks

### Assumptions

* Microsoft Visio is used to create the entity relationship diagram model.
* Crow’s foot notation is considered in the ERD model.
* Microsoft SQL Server and SQL Server Management Studio are used to design and maintain the database.

### Constraints

* All customers’ order history can only be seen or changed by administrators.
* One flight ticket can only be booked by one customer, one customer can buy more than one flight tickets either for themselves or for others.
* Customer can only cancel flight tickets twice in one day.
* Flight information can only be changed by one administrator at one time.

### Risks

* There may be mistake input in flight information because only one administrator is needed to change the information. Once an administrator change the information, it must be approved by at least one other administrator.
* Customers may buy tickets over the amount of the residual tickets. Warning or error should be generated when this situation happens.

## Design Decisions

### Identify Entity Types

|  |  |  |
| --- | --- | --- |
| Entity Name | Description | Why included |
| User | All general information needed as a user, such as userID, address and telephone number. | The main function of this database is the interaction with users. Therefore, we want to use this entity to record basic users’ information. |
| Customer | As a subclass of User, besides all general user information, extra information is needed as a registered customer. Such as order history and payment method. | In this database, some functions must be operated by customers. And some extra attributes are needed for that. |
| Administrator | As a subclass of User, besides all general information, extra information is needed as an administrator. Such as working schedule and salary. | In this database, some functions must be operated by administrator. And some extra attributes are needed for that. |
| Booking | This entity is used as a record for each booking processed by customers to buy flight tickets. | We need to use this entity to connect passenger and customer information with ticket. In database, we also pass each booking information to order history entity. |
| Passenger | This entity is used to record all passenger information provided by customers when they book the tickets. | Since customers are likely to buy tickets for more than one passengers, we need this entity to record all the passenger information which might be different from customer information. |
| OrderHistory | Record every order from corresponding customer. Customers can check all their own orders and administrators can check all orders. | As administrators, we want to check all customers’ order history. As customers, we want to check all my own travel history. We use this entity to record every customers’ booking information. |
| Ticket | Information like specific flight, seats and price. | We need an entity functioning as a ticket to present all information that customers want to see. |
| Income | Recording every ticket’s profit. | As administrator, we want to know our profit generated from each sold ticket. |
| Seat | Seat information like location, type and price. | We want to distinguish seats. Different seats should have different price and service. |
| Flight | Specific flight information like direction, airplane and flight departure & arrival time. | We can’t include all detailed information in ticket entity, so we need to use this entity to present more detailed flight information. |
| Airplane | Airplane information like capacity, model. | We want to record airplane information like capacity and model for each flight. |
| FlightStatus | Users can check specific flight status like on-time, early or delayed. | Customers may want to check their flight status and administrators also need this entity to update the status of each flight. |
| Direction | Record departure airport and arrival airport for different flights. | We can’t include all airports’ detailed information in the Flight entity, so we use this entity to connect airport entity with flight entity. |
| DepartureAirport | Information about departure airport like location, terminal and departure gate. | A particular flight needs departure airport. |
| ArrivalAirport | Information about arrival airport like location, terminal and arrival gate. | A particular flight needs arrival airport. |
| AirlineCompany | Airline company information like address and contact number. | Through this entity, we can connect aircrew entity and airplane entity. |
| Staff | All staff’s information for every airline company. | As an airline company, they should have lots of staff with different positions. |
| Aircrew | A group of staff working as an aircrew team to serve one flight. | We want to group several staff as an aircrew team, so it’ll be easier to connect one group to one flight. |

### Identify Relationship Types

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Entity name | Multuplicity | Relationship | Multiplicity | Entity name |
| User | 1..1  1..1 | ContainsC  ContainsA | 1..1  1..1 | Customer  Administrator |
| Customer | 1..1  1..1 | Processes  enquires | 0..\*  0..1 | Booking  Order History |
| Order History | 1..1 | Records | 1..\* | Booking |
| Booking | 1..1  1..1 | Requires  Generates | 1..\*  1..\* | Passenger  Ticket |
| Ticket | 1..1  1..1  0..\*  0..\* | Shows  Brings  Corresponds  Indicates | 1..1  1..1  1..1  1..1 | Passenger  Income  Seat  Flight |
| Flight | 1..1  1..\*  1..\* | Refers  Towards  Servedby | 1..1  1..1  1..1 | Flight Status  Direction  Aircrew |
| Airplane | 1..1  0..\*  1..1 | Equipedwith  Ownedby  Flies | 1..\*  1..1  0..\* | Seat  AirlineCompany  Flight |
| Direction | 1..\*  1..\* | Leaves  Arrives | 1..1  1..1 | DepartureAirport  ArrivalAirport |
| AirlineCompany | 1..1 | Employs | 1..\* | Staff |
| Staff | 1..\* | forms | 0..1 | Aircrew |

### Identify Attributes

|  |  |
| --- | --- |
| Entity name | Attributes |
| User | userID  userType  fName  lName  phoneNumber  address  e-mail  gender  DOB |
| Customer | userID  payment  orderID |
| Administrator | userID  workingShift  salary |
| Order History | orderID  userID  bookingID |
| Booking | bookingID  userID  passengerID  ticketNumber  orderTime |
| Passenger | passengerID  fName  lName  DOB  phoneNumber  e-mail  country |
| Ticket | ticketNumber  bookingID  passengerID  seatNumber  flightNumber  directionID  price  serviceFee |
| Income | incomeID  ticketNumber  profit |
| Seat | airplaneID  seatNumber  type |
| Flight | flightNumber  directionID  airplaneID |
| Flight Status | flightNumber  directionID  flightStatus  ifApproved |
| Airplane | airplaneID  model  capacity  companyID |
| Direction | directionID  departureTime  departureAirportCode  departureTerminal  departureGate  arrivalTime  arrivalAirportCode  arrivalTerminal  arrivalGate  duration |
| DepartureAirport | departureAirportCode  address |
| ArrivalAirport | arrivalAirportCode  address |
| AirlineCompany | companyID  companyName  contactPhone  address |
| Staff | staffNo  companyID  fName  lName  phoneNumber  address  e-mail  gender  DOB  title  department  salary |
| Aircrew | aircrewID  staffNo  FlightNumber |