DATABASE MANAGEMENT SYSTEMS

AIRPORT DATABASE PROJECT

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Project Overview

This Database Management Systems (DBMS) project is to design and model an airport scenario. The input data used in this project is solely for this project's purpose and is not real.

To develop the database, the following steps were performed:

- An airport scenario was developed.
- First, a realistic airport scenario was developed that included all of the necessary operations, including flights, passengers, staff, and ticketing.
- The ER diagram was converted into a Relational model to represent all the tables of this database.
- All the tables with attributes, data types, and relationships (primary and foreign keys) were carefully specified while creating the tables on MySQL.

This project illustrates the entire database design process for an airport management system, from concept to well-organized relational tables.

ENTITIES

The following entities are being considered in this database.

1. Passenger
2. Flight
3. Airline
4. Plane
5. Pilot

PASSENGER

The attributes present in this entity are:

1. Passport_no (Primary Key)
2. Name
3. Age
4. Gender
5. Passenger_id

FLIGHT

The attributes present in this entity are:

1. Flight_ID (Primary Key)
2. Destination
3. Departure_Time
4. Arrival_Time
5. Status

AIRLINE

The attributes present in this entity are:

1. Airline_ID (Primary Key)
2. Airline_Name
3. Country

PLANE

The attributes present in this entity are:

1. Plane_ID (Primary Key)
2. Model
3. Capacity
4. Airline_ID (Foreign Key)

PILOT

The attributes present in this entity are:

1. Pilot_ID (Primary Key)
2. License_No
3. Experience
4. Airline_ID (Foreign Key)

PARTICIPATION & RELATIONSHIP

The participation and relationship of all the entities in the relationship is as follows:

Relationship	Entity	Participation	Cardinality
books	Passenger Flight	Full Full	M:N
operated_by	Flight Airline	Full Partial	N:1
assigned_to	Flight Plane	Full Partial	N:1
belongs_to	Plane Airline	Partial Full	N:1
flown_by	Plane Pilot	Partial Full	N:1
works_for	Plane Airline	Full Partial	N:1

CARDINALITY RATIOS

1. **Passenger → Flights** using **books** is **M:N** as many passengers can book many flights.
2. **Flight → Airline** using **operated_by** is **N:1** as many flights belong to a single airline.
3. **Flight → Plane** using **assigned_to** is **N:1** as each flight must be assigned to a single plane.
4. **Plane → Airline** using **belongs_to** is **N:1** as many planes can belong to a single airline.
5. **Plane → Pilot** using **flown_by** is **N:1** as one pilot flies only one plane.
6. **Pilot → Airline** using **works_for** is **N:1** as one pilot works for only one airline.

STRUCTURAL CONSTRAINTS

The following structural constraints are kept in mind while making this scenario:

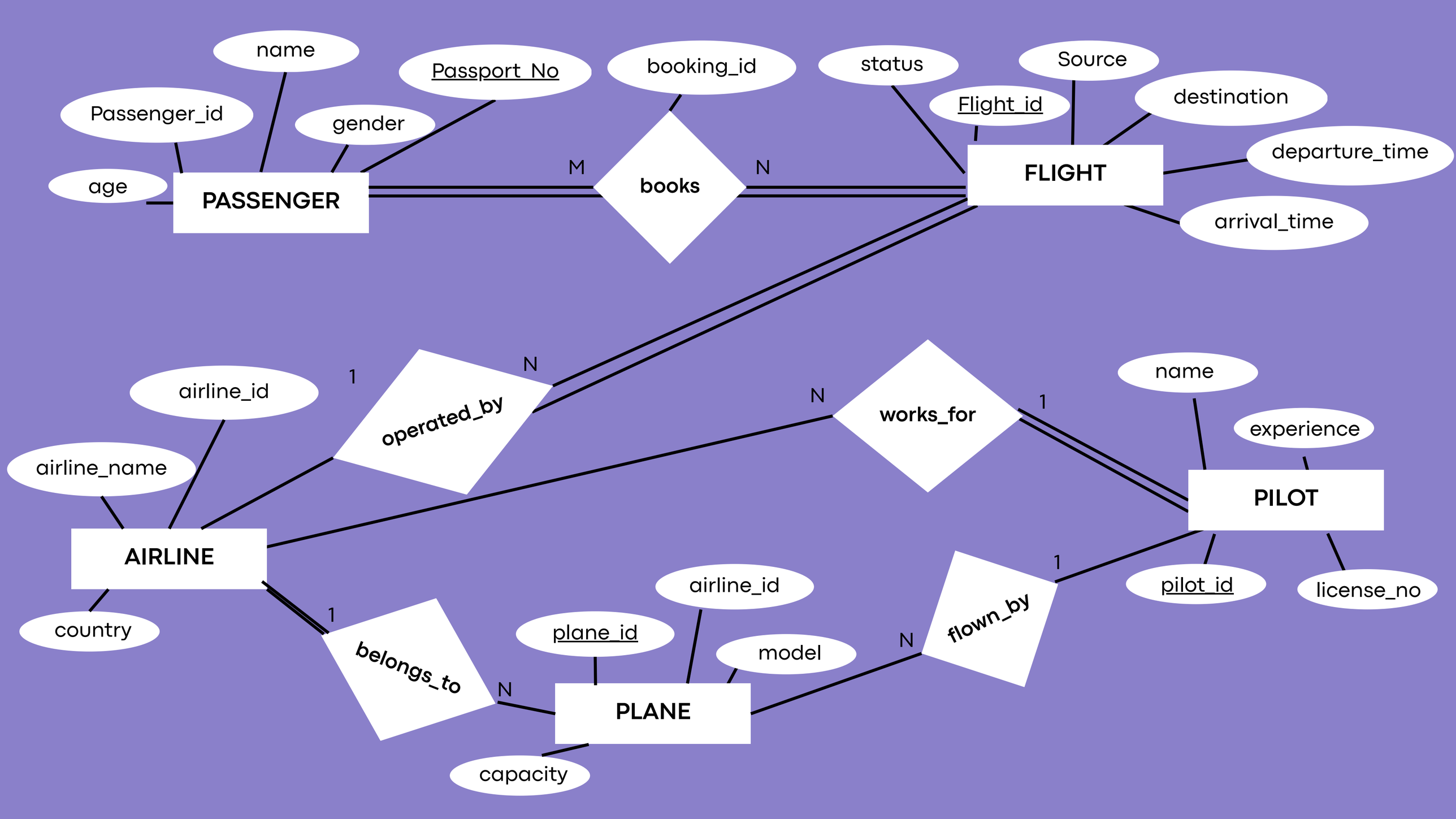
1. Each passenger must book at least one flight.
2. A flight must be linked to one plane and one airline.
3. Each plane must belong to one airline.
4. Each pilot must work for exactly one airline.

Scenario as a Normal Person

The scenario that is taken is of an airport. The entities that are taken are passenger, flight, airline, plane and pilot. Each passenger have their details like passenger id, name, age, gender and passport number. Passenger id and passport number are unique for each passenger. Passengers book flights and get a unique flight is. Flights also include source, departure time, arrival time and the destination. Each airline has its own unique airline id, name and country of origin. All the planes have their unique id, model and capacity. In addition to this, each plane is associated with an airline. No plane can be associated with two airlines. A pilot has her/her unique id and license no. A pilot is associated with only one airline. A pilot has his/her name and some years of experience. All of these comprise of the entities in the airport database. In addition to this, all the entities are related to each other with certain relationships where a passenger books flights that is assigned to a singe plane and is operated by an airline. A flight is flown by a pilot who works for a single airline. One passenger can book many flights and one flight has many passengers so it is a many to many relation. One airline operated many flights but each flight belongs to only one airline which makes it a one to many relationship. One airline owns many planes but many planes belong to one airline making it a one to many relation. One pilot flies only one plane but many planes are flown by many pilots. A pilot works for only one airline whereas one airline has many pilots.

AIRPORT DATABASE PROJECT

ENTITY RELATIONSHIP (ER) DIAGRAM


name
Passport_No
booking_id
status
Source
Passenger_id
gender
Flight_id
destination
departure_time
age
PASSENGER
M
books
N
FLIGHT
arrival_time
airline_id
1
operated_by
N
N
works_for
1
name
airline_name
experience
PILOT
AIRLINE
1
flown_by
pilot_id
license_no
country
1
belongs_to
airline_id
plane_id
model
N
N
PLANE
capacity

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RELATIONAL MODEL DIAGRAM

FLIGHT

status	flight_id	source	destination	departure_time	arrival_time

PASSENGER

name	passport_no	age	gender	passenger_id

AIRLINE

country	airline_name	airline_id	pilot_id

PLANE

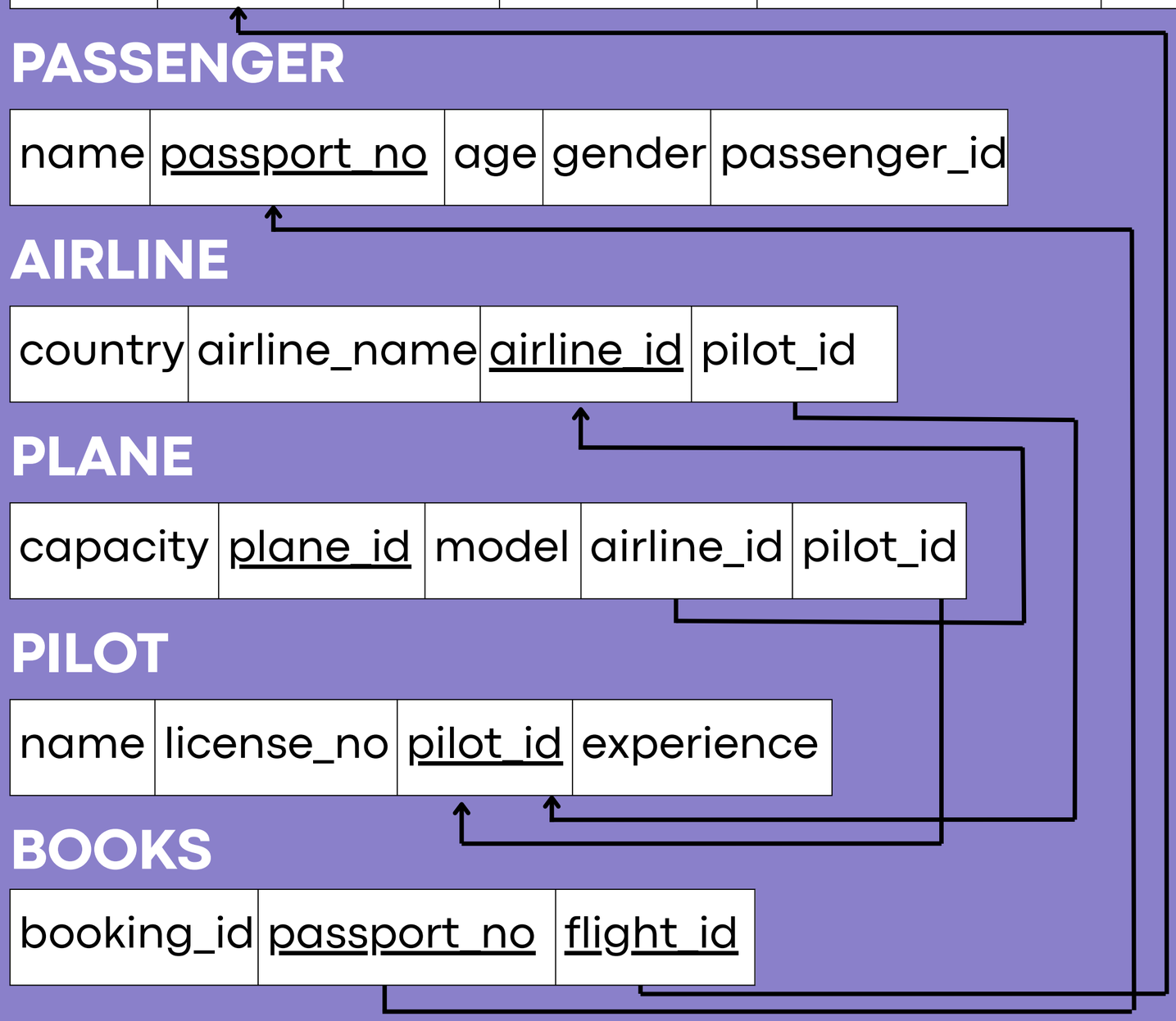
capacity	plane_id	model	airline_id	pilot_id

PILOT

name	license_no	pilot_id	experience

BOOKS

booking_id	passport_no	flight_id



AIRPORT DATABASE PROJECT

MySQL TABLES

DATABASE

We will first create the database and then use it.

mysql> create database airport;

```
mysql> create database airport;
Query OK, 1 row affected (0.01 sec)
```

mysql> use airport;

```
mysql> use airport;
Database changed
```

TABLE - FLIGHT

```
mysql> create table FLIGHT
    -> (flight_id varchar(10) primary key,
    -> status varchar(15) not null default "not available",
    -> source varchar(20) not null,
    -> destination varchar(20) not null,
    -> departure_time datetime not null,
    -> arrival_time datetime not null);
```

```
mysql> create table FLIGHT
    -> (flight_id varchar(10) primary key,
    -> status varchar(15) not null default "not available",
    -> source varchar(20) not null,
    -> destination varchar(20) not null,
    -> departure_time datetime not null,
    -> arrival_time datetime not null);
Query OK, 0 rows affected (0.06 sec)
```

TABLE - FLIGHT

mysql> desc FLIGHT;

```
mysql> desc FLIGHT;
+----------------+------------+------+-----+---------------+-------+
| Field          | Type       | Null | Key | Default       | Extra |
+----------------+------------+------+-----+---------------+-------+
| flight_id      | varchar(10) | NO   | PRI | NULL          |       |
| status         | varchar(15) | NO   |     | not available |       |
| source         | varchar(20) | NO   |     | NULL          |       |
| destination    | varchar(20) | NO   |     | NULL          |       |
| departure_time | datetime   | NO   |     | NULL          |       |
| arrival_time   | datetime   | NO   |     | NULL          |       |
+----------------+------------+------+-----+---------------+-------+
6 rows in set (0.03 sec)
```

TABLE - PASSENGER

```
mysql> create table PASSENGER
    -> (name varchar(50) not null,
    -> age int not null,
    -> gender varchar(5) not null,
    -> passport_no varchar(15) primary key,
    -> passenger_id varchar(20) not null);
```

```
mysql> create table PASSENGER
    -> (name varchar(50) not null,
    -> age int not null,
    -> gender varchar(5) not null,
    -> passport_no varchar(15) primary key,
    -> passenger_id varchar(20) not null);
Query OK, 0 rows affected (0.03 sec)
```

TABLE - PASSENGER

mysql> desc PASSENGER;

```
mysql> desc PASSENGER;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| name         | varchar(50) | NO   |     | NULL    |       |
| age          | int         | NO   |     | NULL    |       |
| gender       | varchar(5)  | NO   |     | NULL    |       |
| passport_no  | varchar(15) | NO   | PRI | NULL    |       |
| passenger_id | varchar(20) | NO   |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

TABLE - PILOT

```
mysql> create table PILOT
    -> (pilot_id varchar(20) primary key,
    -> name varchar(50) not null,
    -> license_no varchar(20) not null,
    -> experience int);
```

```
mysql> create table PILOT
    -> (pilot_id varchar(20) primary key,
    -> name varchar(50) not null,
    -> license_no varchar(20) not null,
    -> experience int);
Query OK, 0 rows affected (0.03 sec)
```

TABLE - PILOT

mysql> desc PILOT;

```
mysql> desc PILOT;
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| pilot_id   | varchar(20) | NO   | PRI | NULL    |       |
| name       | varchar(50) | NO   |     | NULL    |       |
| license_no | varchar(20) | NO   |     | NULL    |       |
| experience | int         | YES  |     | NULL    |       |
+------------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

TABLE - AIRLINE

```
mysql> create table AIRLINE
    -> (airline_id varchar(20) primary key,
    -> airline_name varchar(20) not null,
    -> country varchar(50) not null,
    -> pilot_id varchar(20) references pilot(pilot_id));
```

```
mysql> create table AIRLINE
    -> (airline_id varchar(20) primary key,
    -> airline_name varchar(20) not null,
    -> country varchar(50) not null,
    -> pilot_id varchar(20) references pilot(pilot_id));
Query OK, 0 rows affected (0.03 sec)
```

TABLE - AIRLINE

mysql> desc AIRLINE;

```
mysql> desc AIRLINE;
+--------------+-------------+------+-----+---------+-------+
| Field        | Type        | Null | Key | Default | Extra |
+--------------+-------------+------+-----+---------+-------+
| airline_id   | varchar(20) | NO   | PRI | NULL    |       |
| airline_name | varchar(20) | NO   |     | NULL    |       |
| country      | varchar(50) | NO   |     | NULL    |       |
| pilot_id     | varchar(20) | YES  |     | NULL    |       |
+--------------+-------------+------+-----+---------+-------+
4 rows in set (0.00 sec)
```

TABLE - PLANE

```
mysql> create table PLANE
    -> (plane_id varchar(20) primary key,
    -> model varchar(20) not null,
    -> capacity int not null,
    -> airline_id varchar(20) references airline(airline_id),
    -> pilot_id varchar(20) references pilot(pilot_id));
```

```
mysql> create table PLANE
    -> (plane_id varchar(20) primary key,
    -> model varchar(20) not null,
    -> capacity int not null,
    -> airline_id varchar(20) references airline(airline_id),
    -> pilot_id varchar(20) references pilot(pilot_id));
Query OK, 0 rows affected (0.03 sec)
```

TABLE - PLANE

mysql> desc PLANE;

```
mysql> desc PLANE;
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| plane_id   | varchar(20) | NO   | PRI | NULL    |       |
| model      | varchar(20) | NO   |     | NULL    |       |
| capacity   | int         | NO   |     | NULL    |       |
| airline_id | varchar(20) | YES  |     | NULL    |       |
| pilot_id   | varchar(20) | YES  |     | NULL    |       |
+------------+-------------+------+-----+---------+-------+
5 rows in set (0.00 sec)
```

TABLE - BOOKS

```
mysql> create table BOOKS
    -> (booking_id varchar(20) not null,
    -> passport_no varchar(15) references passenger(passport_no),
    -> flight_id varchar(10) references flight(flight_id));
```

```
mysql> create table BOOKS
    -> (booking_id varchar(20) not null,
    -> passport_no varchar(15) references passenger(passport_no),
    -> flight_id varchar(10) references flight(flight_id));
Query OK, 0 rows affected (0.03 sec)
```

TABLE - BOOKS

mysql> desc BOOKS;

```
mysql> desc BOOKS;
+-------------+-------------+------+-----+---------+-------+
| Field       | Type        | Null | Key | Default | Extra |
+-------------+-------------+------+-----+---------+-------+
| booking_id  | varchar(20) | NO   |     | NULL    |       |
| passport_no | varchar(15) | YES  |     | NULL    |       |
| flight_id   | varchar(10) | YES  |     | NULL    |       |
+-------------+-------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

ALL TABLES IN THE DATABASE

mysql> show tables;

```
mysql> show tables;
+--------------------+
| Tables_in_airport |
+--------------------+
| airline            |
| books              |
| flight             |
| passenger          |
| pilot              |
| plane              |
+--------------------+
6 rows in set (0.01 sec)
```