Database Design Revision Documentation

Introduction

The revisions aim to further normalize our database entities, reduce redundant data, and identify additional entities, ensuring our model adheres to the third normal form (3NF), unless otherwise justified for denormalization.

Changes to the ERD

Entity Normalization and Relationship Refactoring

1. **Associative Entities Introduction**
- Staff Assignment (Associative Entity): To resolve a many-to-many relationship between `Flight` and `Staff`, we introduced the `Staff Assignment` associative entity.
- Customer Support Assignment (Associative Entity): Similarly, to resolve a many-to-many relationship between `Crew Members` and `Customer Support`, the `Customer Support Assignment` associative entity was created.

Relationship Naming and Directionality

2. **Two-Way Relationship Naming**
- All existing entities that previously had one-way relationships have now been updated to have explicit two-way relationship names.

New and Updated Relationships

3. **Pilot to Flight Relationship**
- A new one-to-many relationship has been established between `Pilot` and `Flight` entities to accurately model the assignment of pilots to flights.

4. **Reservation to Payment Relationship**
- The relationship between `Reservation` and `Payment` has been updated from a one-to-many to a one-to-one relationship, reflecting the business rule that each reservation corresponds to a single payment.

Foreign Key Additions

5. **Introduction of Foreign Keys**
● Aircraft_ID (FK)` added to `Flight` entity.
● Flight_ID (FK)` added to `Airport` entity
● Account_ID (FK)` added to `Reservation` entity.
● Reservation_ID (FK)` added to `Payment`, `Cancellation`, and `Confirmation` entities to maintain transaction traceability.
● Account_ID (FK)` added to `Confirmation`, `Customer Support`, and `Passengers` entities to link user activities and support interactions to user accounts.
● Aircraft_ID (FK)` added to `Seat` entity to confirm seat assignments to specific aircraft.

Specialization and Disjointness

6. **Payment and Staff Supertype Specialization**
● Total specialization and disjoint constraints have been applied to `Payment` and `Staff` supertypes to give clear and exclusive roles for each subtype, preventing role overlap and maintaining integrity.

Flight and Airport Connectivity

7. **Flight Departure and Arrival Connectivity**
● The `Flight` entity's `Departure` and `Arrival` attributes are now explicitly connected to the `Airport` entity, for accurate tracking of flight itineraries.

Aircraft Utilization

8. **Aircraft Flight Reusability**
● The model has been updated to allow `Aircraft` to be used in multiple flights.