

**Harvey Mudd College**  
**Computer Science 133**  
**Database and Knowledgebase Systems**  
**Fall Semester 2001**

**Assignment #1 – The Entity-Relationship Model**  
**Due 5:00pm, Friday September 21, 2001**

This homework is designed to make you conscious of some of the issues facing database designers. Please state any assumptions that you make. Be creative!

You may use any means you want to produce your E-R diagram. Paper and pencil is fine. There are several drawing tools available on the web and locally that you might consider, including TopDown for Macintosh and Visio for Windows (both available on Kato, I believe) and DIA for X-Windows (available on turing) and Windows as well. There is also a package called SmartDraw (<http://www.smartdraw.com>) for windows which has a free trial version you can download.<sup>1</sup>

You are asked to design a database for a national airline. In the database, the company wishes to keep track of reservation information as well as operational information.

Reservation information consists of passenger information (name and address), and departure information (flight number, date, source, destination, departure time and arrival time). Most of this information is always the same for a given flight number, with only the date changing. When a passenger makes a booking on a departure, a ticket number is issued. When a passenger checks in for the flight they are given a seat assignment and their bags are each tagged with a bag number which is unique for that flight.

The source and destination of a flight are, naturally, airports. The airline keeps track of data on the airports it flies from, including the airport name, city and state, three-letter airport code, and geographic location (longitude and latitude). You may find it useful to define the notion of a route (a trip with a source and a destination, but no time) independent of a flight. You may assume that all flights are non-stop.

Operational information consists of information about employees (employee number, name, address and salary) and planes (FAA identification number, manufacturer, model number, serial number, service history, and number of seats). Some of the employees are pilots, who are characterized by their cockpit position (i.e. pilot, navigator, etc.) and the types of planes they can operate in. Some employees are ground crew, who are characterized by what department they work in, and at which airport. All other employees are attendants, who are characterized by their seniority level. Attendants and pilots both record a list of routes they prefer to fly on, with a numeric preference ranking. No employee is in more than one of these groups, and a ground crewperson works in one and only one department and airport. Employees may also be passengers, but they have no special status when considered as such.

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<sup>1</sup>The only one of these I have actually used is TopDown, so I cannot be of much help in using the others.

Additional operational information includes the assignment of departures to planes, the assignment of pilots to departures, and the assignment of attendants to departures.

1. Draw an entity-relationship diagram for this enterprise. Use generalization, specialization and aggregation where appropriate. Do not use multi-valued attributes. Compound attributes are allowed, if they make sense. Make sure to note any weak entity sets, and to mark the primary keys/discriminators of all the entity sets.

Make sure to designate any participation and multiplicity constraints.

2. Is there any relevant information or are there any constraints implicit in the specification that you cannot represent in your diagram? If so, what?
3. Give SQL commands to create tables corresponding to your diagram. (Do not worry too much about the domain of each attribute. Just pick something reasonable.) Make sure you specify primary and candidate key constraints as well as foreign key constraints. If there are any of the latter, specify the appropriate action for deletion from the referenced table.
4. Suppose the airline wanted to track its on-time record. How would you modify your diagram and tables?
5. Suppose the airline wanted to keep track of people who are flying together so that it could attempt to seat them together. How would you change your diagram? What changes/additions would this impart to the tables? What limitations do you see in this solution?