



California Airline Software System

Specification Document

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FreeLance

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1. Problem Statement

The following document outlines requirements for the development of airline management software for California Airlines (CAI) such that employees and customers are able to easily view and purchase flights, check flight status, and generate statistics to monitor company performance, among other features. Additionally, employees must be able to schedule new flights, set flight pricing, and get price recommendations for new flights.

System Description

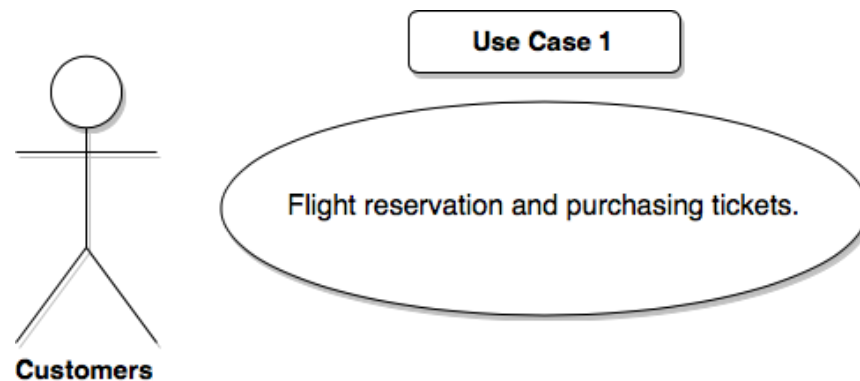
The system will be organized into three major categories: Database, Customer Accounts, and Employee Accounts.

1. **Database** will store information pertaining to flight date, location, price, and passengers, and can only be directly edited by employee accounts. The database will be viewed through a GUI for both employees and customers.
2. **Employee accounts** will be registered to each employee at CAI and allow employees to directly edit the database such as through scheduling flights, setting flight statuses, and setting ticket prices. Employee accounts also have all privileges given to customer accounts.
3. **Customer accounts** allow customers of CAI to view and purchase flights, check in, and view flight statuses. Customers which have not created an account are only able to view flight information and status.

2. Users and Use Cases

Users of this software are employees of CAI and customers of CAI. Employees will have an employee account that allows them to schedule flights, set ticket price, and edit flight status. Customers will have a customer account that allows them to view and purchase flight tickets, check in to flights, and view flight statuses.

Use Case 1: Flight Reservation and Purchasing a Ticket



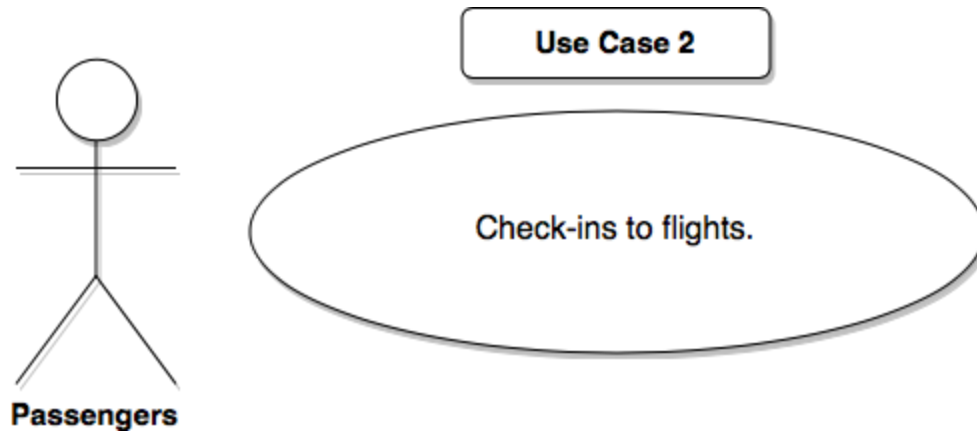
Description

The "Flight Reservation and Purchasing Tickets" use case refers to the ability of a registered customer to reserve a seat on a flight, receiving in return a confirmation number and flight number.

Step-by-step Description

1. Input necessary log-in information which includes:
 - User name
 - Password.
2. Click "Login" button.
3. Click "Booking" option.
4. Select Destination from 1 of 6 options in drop down menu.
5. Select Day of Departure.
6. Choose from one of the resulting departure times for that day.
7. Select Day of Return.
8. Choose from one of the resulting returning times for that day.
9. Click "Confirm Flight Details".
10. Submission will not be accepted with missing/unspecified fields.
11. Input information to purchase via credit card, which includes:
 - Credit card number
 - Expiration Date
 - CSV
 - Billing Address
12. Click "Confirm Purchase".
13. Submission will not be accepted with missing/unspecified fields.
14. Seats will be reserved on Departure and Return Flights.
15. Flight number used for check-in will be presented to customer via popup.

Use Case 2: Check in to Flights



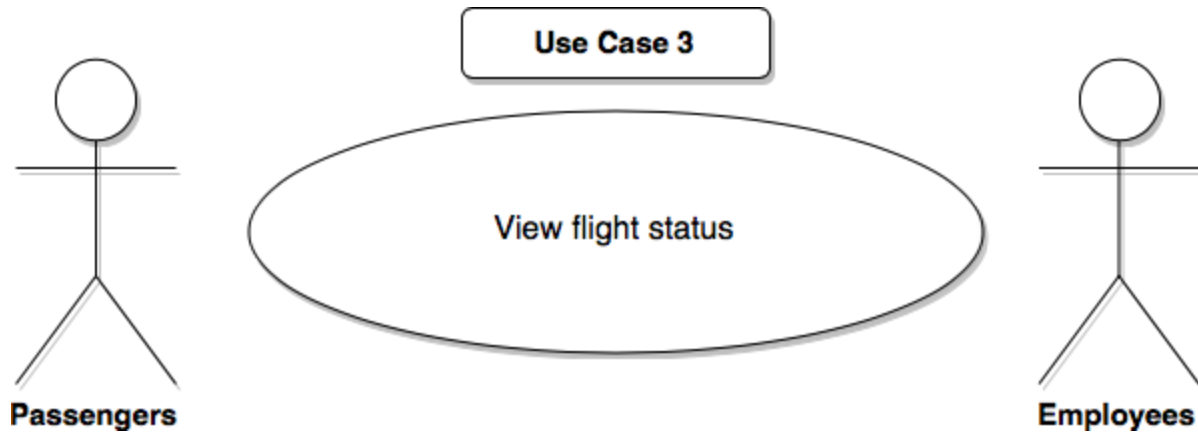
Description

The "Check-ins to Flights" use case refers to the ability of a registered customer who has purchased an upcoming flight to confirm that they will be traveling and receive in return a boarding pass to print.

Step-by-step Description

1. Enter flight number
2. Click the "Check In" button.
 - 2.1. Bags can optionally be added by the customer.
 - 2.2. An agreement regarding firearms, hazardous materials, and other important information from TSA will be presented.
3. Receive confirmation screen.
4. The customer's account will be updated to signify that the customer has checked in to the flight.

Use Case 3: Viewing Flight Status



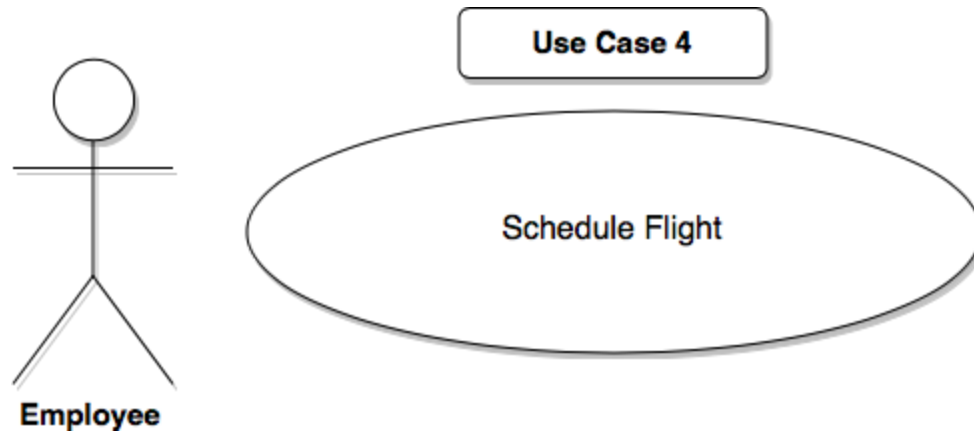
Description

The "View Flight Status" use case refers to the ability of any employee or customer, regardless of whether or not they have purchased a ticket, to view updates on flight status and departure time.

Step-by-step Description

1. Input a flight number.
2. Click "Submit."
 - 2.1. Search the number in the database and display any matching flights.
 - 2.2. Print an error message if no flight is found.
3. Flight status is displayed: On time, Delayed, or Cancelled

Use Case 4: Schedule Flights



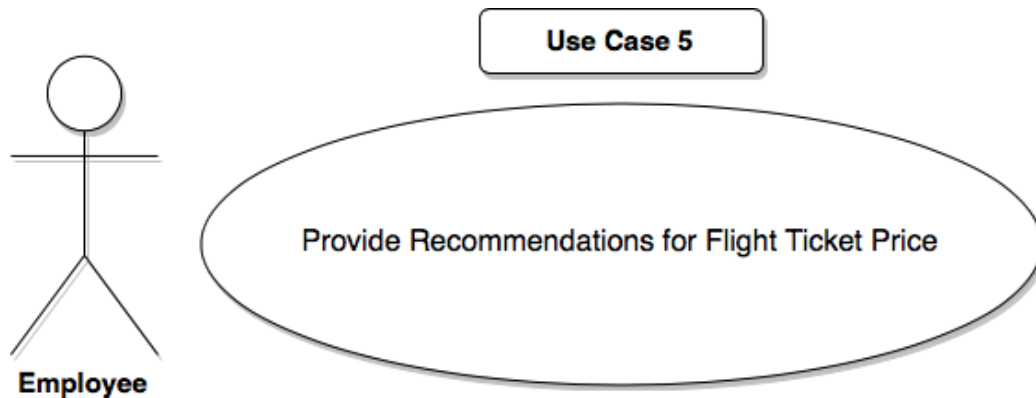
Description

The "Schedule Flight" use case refers to the ability of a CAI employee to schedule an upcoming flight, provided the flight meets requirements such as runway delay time and plane availability.

Step-by-step Description

1. Click "Pricing and Scheduling"
2. Specify flight details.
 - 2.1. Select Destination
 - 2.2. Select date and time
3. Check for conflicts
 - 3.1. Ensure the plane for that route is free
 - 3.2. Ensure the runway is available for at least 40 minutes
 - 3.3. Display warnings if anything produced an error
4. Click "Set Flight"

Use Case 5: Provide Recommendations for Flight Ticket Price



Description

The "Provide Recommendations for Flight Ticket Price" use case refers to the ability of a CAI employee to input a flight on a desired date and time and receive a range of recommended ticket prices based upon empty seats for the past two weeks.

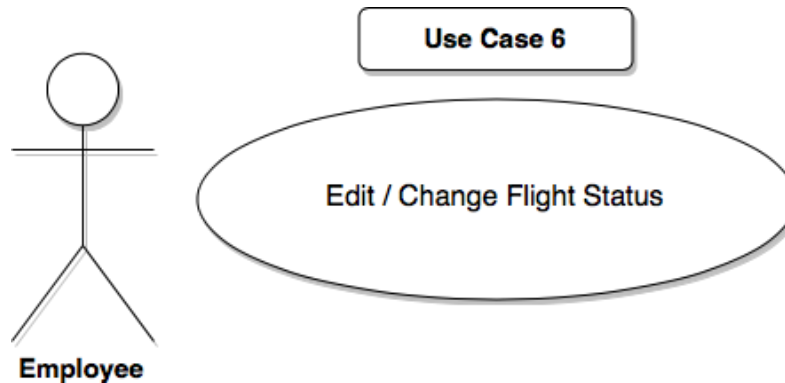
Step-by-step Description

1. Schedule a flight from "Pricing and Scheduling"
2. Enter a base price
3. An adjusted price is displayed and calculated by the following:
 - 3.1. Price is based upon the percentage of empty seats in the last two weeks for the destination of interest
 - 3.2. The average value of the empty seats (X) is calculated
 - 3.3. Base flight price (P) is retrieved from database
 - 3.4. A fair price for the flight (p) is determined using the formula:

$$p = P - [(X / 2) * P]$$

Note: In the first three weeks of operation, the formula will assume zero empty seats, thus outputting the base price.

Use Case 6: Edit / Change Flight Status



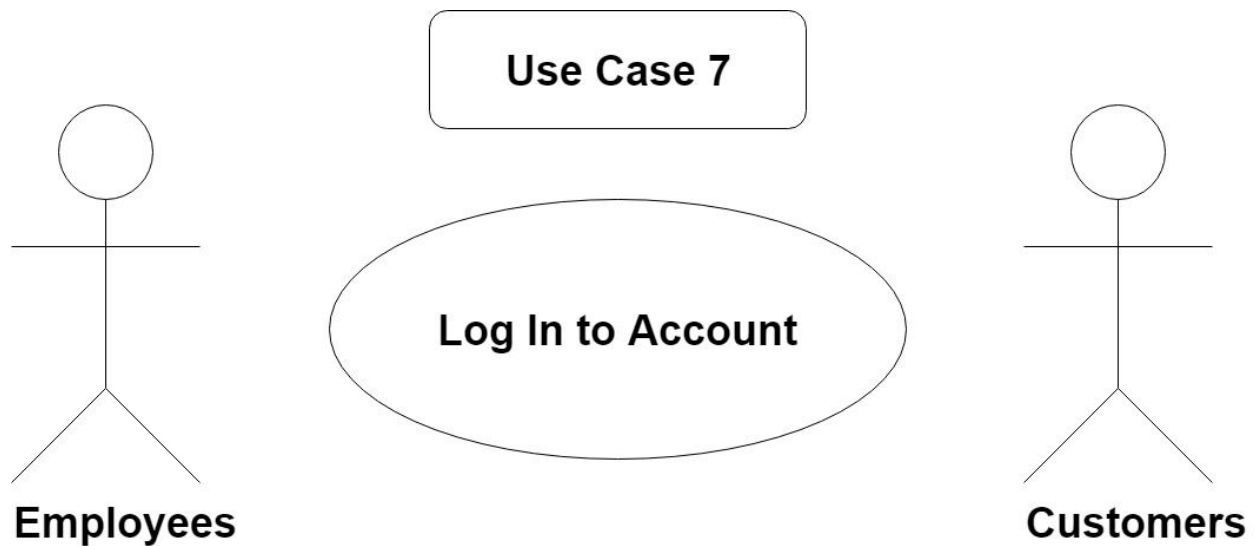
Description

The "Edit / Change Flight Status" use case refers to the ability of a CAI employee to edit the status of an upcoming flight.

Step-by-step Description

1. Click the "Flight Status" tab
2. Enter the flight id and select the desired flight from the table
3. Select flight status option:
 - On Time
 - Delayed
 - Cancelled
4. Click "Save Flight Status"

Use Case 7: Login



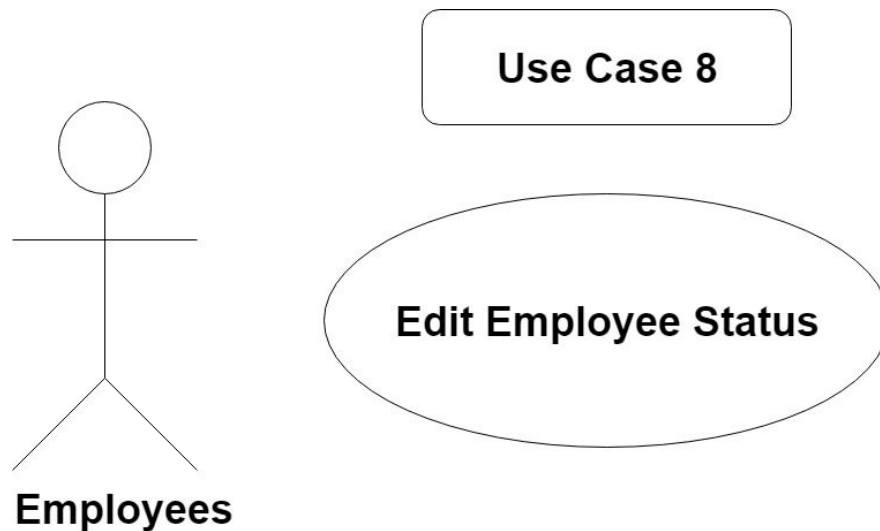
Description

The Login use case refers to the ability of a user to log in to their account on the system as either an employee or customer

Step-by-step Description

1. Click the desired login type: either "Customer" or "Employee"
2. Enter username and password of existing account
3. The appropriate account homepage is displayed based upon login type.

Use Case 8: Employee Edit Other Employee Status



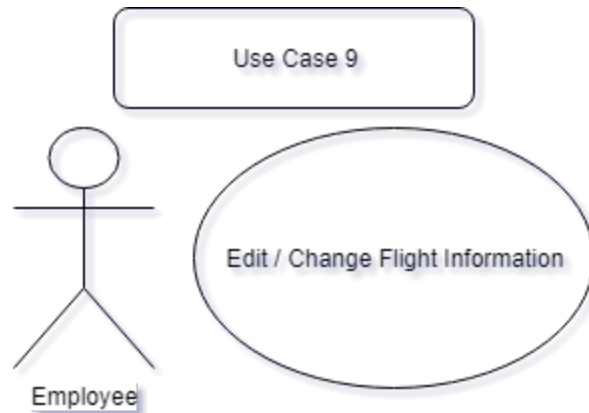
Description

The "Employee Edit Other Employee Status" use case refers to the ability of a CAI employee to edit another employee's employment status.

Step-by-step Description

1. Click the "Employee Management" tab
2. Click "Remove Employee" to remove an employee or "New Employee" to add an employee.
3. If adding an employee, input username, first name, and last name
4. If removing an employee, select an employee from the table and click "Remove Employee"

Use Case 9: Edit / Change Flight Information



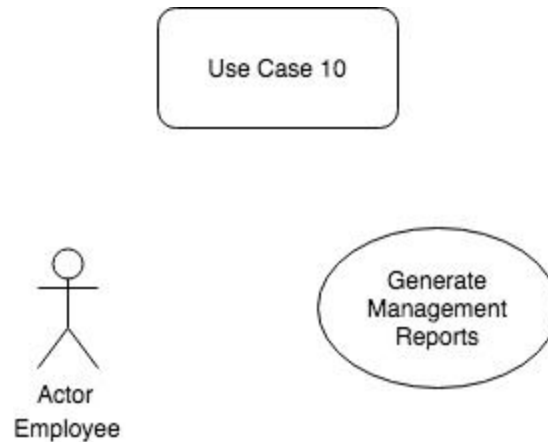
Description

The "Edit / Change Flight Information" use case refers to the ability of a CAI employee to edit the date, destination, departure time, arrival time, or price of an upcoming flight.

Step-by-step Description

1. Enter source city, destination city, departure time, base price, and arrival time.
2. Click "Set Flight".
3. The flight will only be set if it meets the 40 minute runway time constraint.
4. A confirmation will appear with the recommended price and other data entered into the system database.

Use Case 10: Generate Management Reports



Description

The "Generate Management Reports" use case refers to the ability of a CAI employee to view management reports regarding the system.

Step-by-step Description

1. Click the "Report" tab
2. Select a source and destination, then click "Generate Revenue Report"
3. Revenue from the past two weeks will be displayed
4. Click "Generate Avg. Empty Seat Report"
5. Average number of empty seats will be displayed.

3. Requirements

3a. Functional Requirements

- A customer can purchase a ticket
- A customer can check in to a flight
- A customer can view the status of any flight
- A CAI employee can schedule a flight

- The software provides the CAI employee with price recommendations for a specified flight
- A CAI employee can edit flight status
- A CAI employee can generate business reports
- A CAI employee also has all the functionalities of a customer

3b. Nonfunctional Requirements

- A database is needed to store customer and employee account information.
- A database supporting six destinations is needed to store flight and ticketing information.
- The software must safely and securely store account information.
- The software must maintain fast performance and be responsive to user input.
- The software must display correct data.

3c. Acceptance Criteria

- A customer or employee must be able to purchase a ticket and reserve a seat on a specified flight.
 - The user must be able to select their desired flight from a list
 - The selected seat must appear as taken within the system after reservation
 - The user must be redirected to enter payment information
- An employee must be able to access management reports
 - Revenue per location must be added to the management reports
 - Average seats filled per location must be added to management reports
- A customer or employee must be able to check in to a flight for which they have purchased a ticket.
 - The user must be able to search a flight and select check in
 - A user cannot check in to a flight for which they have not purchased a ticket
- A customer or employee must be able to view the status of any flight.
- A customer or employee must be able to search flights
 - The user must be able to select between round trip or one way flights
 - The user must be able to filter by destination and date
- An employee must be able to schedule a flight, if it meets requirements of 40 minute lag in runway usage.
 - An employee can only schedule a flight to one of the CAI destinations
- An employee must be able to edit flight status of an existing flight.
 - An employee cannot edit flight status of a flight which does not exist
- The software must provide the CAI employee price recommendations for a flight given date, time, and destination.

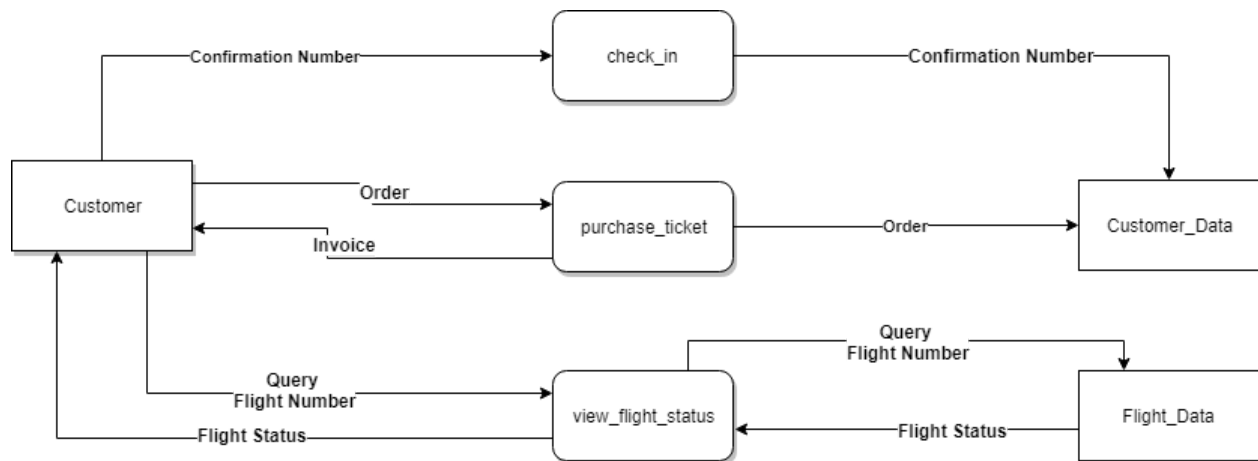
- The software takes input of date, time, and destination from a CAI employee.
- The database is queried for empty seats on flights from the past two weeks for the given destination.
- The formula $P = P - (\frac{X}{2}) * P$ is used to determine a pricing recommendation, where P is the base price to the given destination, and X is the average percentage of empty seats calculated using the previous two weeks of flight information.
- The software outputs a price, in USD.

3d. Constraints

- The software must work on Windows and Mac personal computers.
- The software and database must be available during all working hours.
- The software must maintain functionality without an internet connection.

4. Data Flow Diagram

4a. Level 0 Customer Data Flow Diagram

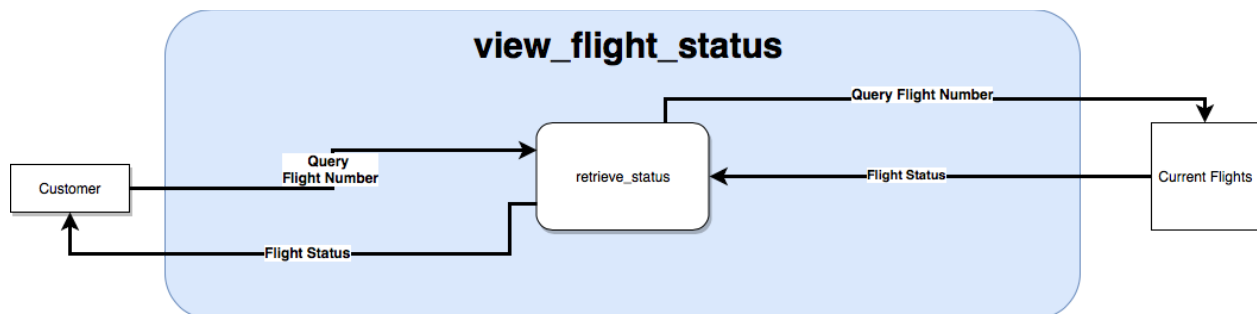


Dictionary for DFD Level 0 - Customer

Name	Description	Narrative
Customer	The account of person purchasing the flight	
check_in	Customer inputs confirmation number and name, get back	Updates flight with the check in

	confirmation	
purchase_ticket	Customer inputs first name, last name, phone number, and birth date, destination, departure, date Get back invoice and confirmation number	Completes the order and creates a confirmation number
view_flight_status	Customer inputs flight number Get back status (On time, delayed, canceled)	Looks up flight status in database
Flight Data	Information about flight schedule, status, and seats taken	For keeping track of flights
Customer Data	Information about passengers (name, phone number, date of birth, if they checked in, flights they are on)	For use in purchasing tickets

4b. Level 1 Customer Data Flow Diagram

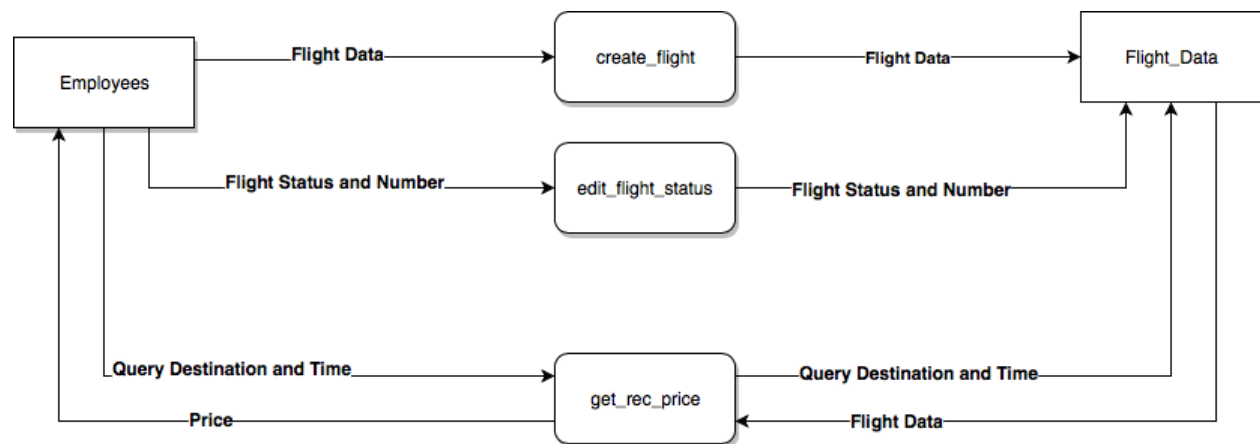


Dictionary for DFD Level 1 - View Flight Status

Name	Description	Narrative
Customer	The account of person purchasing the flight	The customer must have a registered customer account
Flight Number	A unique number specifying a certain flight	The flight number is contained in the Current

		Flights database
Flight Status	Status of flight. One of these: On Time, Delayed, Canceled	Flight status is stored along with a flight number in the Current Flights database
retrieve_status	Queries the Current Flights database using a flight number, receives flight status, and outputs it to the Customer	
Current Flights	A database of currently scheduled flights	

4c. Level 0 Employee Data Flow Diagram

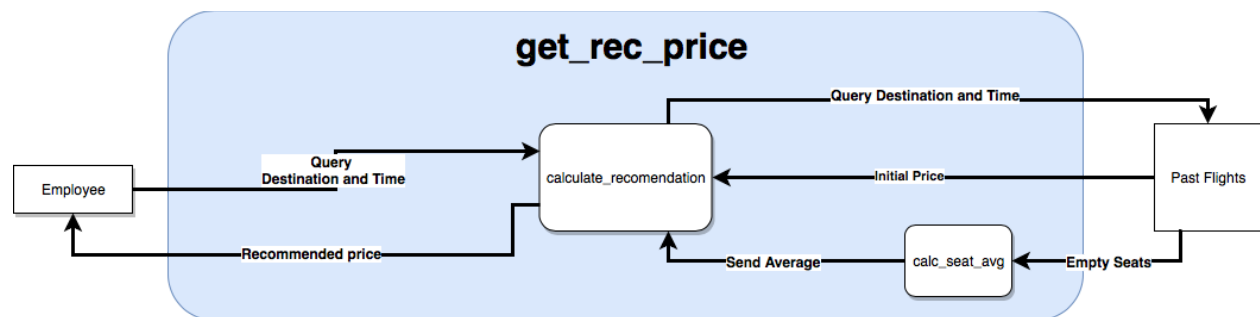


Dictionary for DFD Level 0 - Employee

Name	Description	Narrative
Employee	The account of a registered CAI employee	
create_flight	Employee enters flight time, destination or duration. Gets back conflicts and recommendations	Checks existing flights for conflicts, recommends times, and creates flight plan if no conflicts
edit_flight_status	Employee enters flight	Updates flight status

	number, new status Gets back confirmation	
Flight Data	Information about flight schedule, status, and seats taken	For keeping track of flights
Customer Data	Information about passengers (name, phone number, date of birth, if they checked in, flights they are on)	For use in purchasing tickets
get_rec_price	Enters flight time, destination Gets back price recommendations	Checks prior flights for seats taken

4d. Level 1 Employee Data Flow Diagram



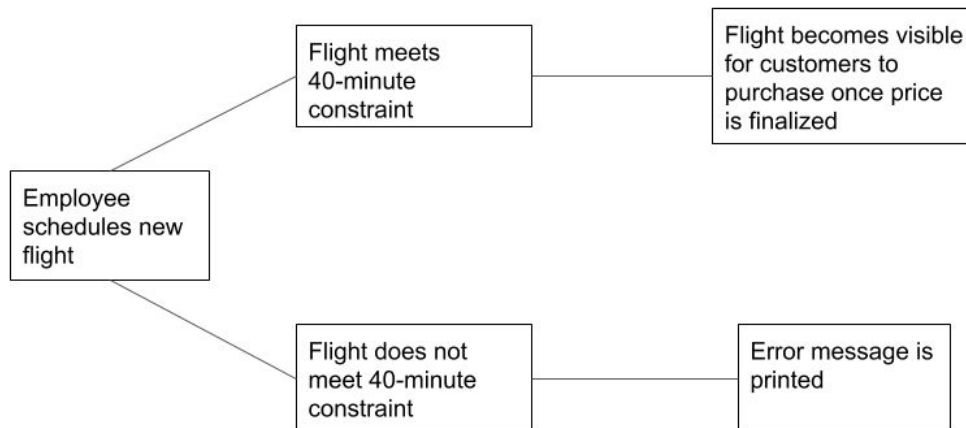
Dictionary for DFD Level 1 - Get Recommended Price

Name	Description	Narrative
Employee	The account of a registered CAI employee	This is the user for the flight price calculation
calculate_recommendation	Calculates the recommendation for price for the given flight based upon empty seats to the given destination in the past two weeks.	This uses the price formula given by $p = p - (X/2)*p$
Past Flights	A database of past CAI flights	This database contains flight information,

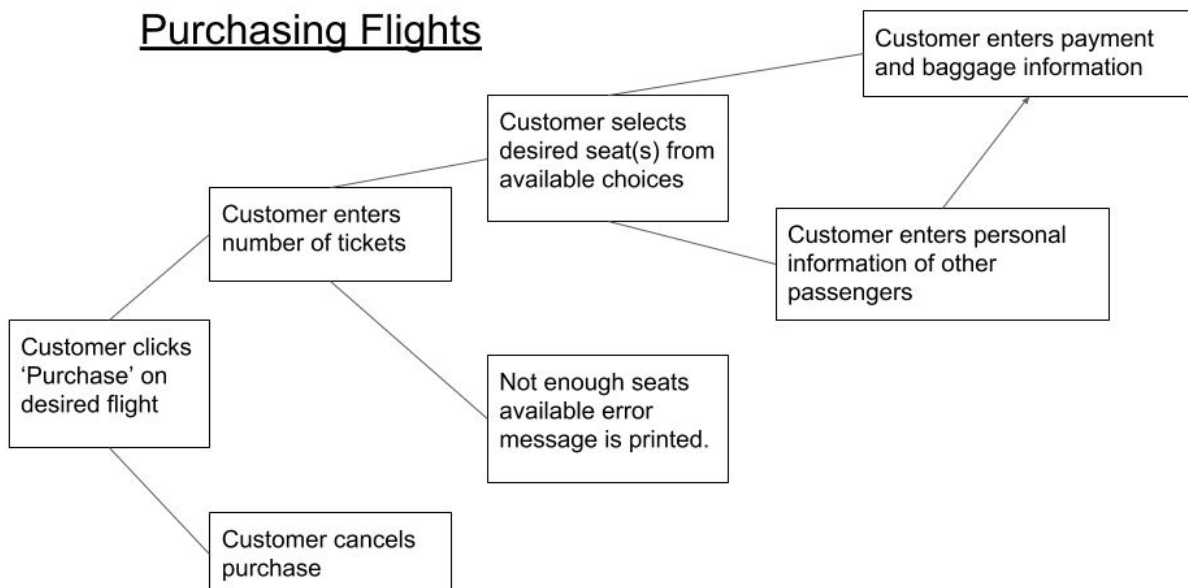
		including seats sold on each flight.
Query Destination and Time	A specific city destination for a flight	
Send Average	The percentage of empty seats in the past two weeks to the destination given by "Destination"	
calc_seat_avg	Calculates the average percentage of empty seats in the past two weeks. Receives empty_seats, outputs average.	Receives total number of flights, then multiplies by 20(seats per flight), and divides total empty seats in all past flights in past two weeks by total seats. Returns result.
Initial Price	Base price for a given flight	
Empty Seats	Total number of empty seats for a destination in the past two weeks	
Recommended Price	The calculated price recommendation	

5. Decision Trees

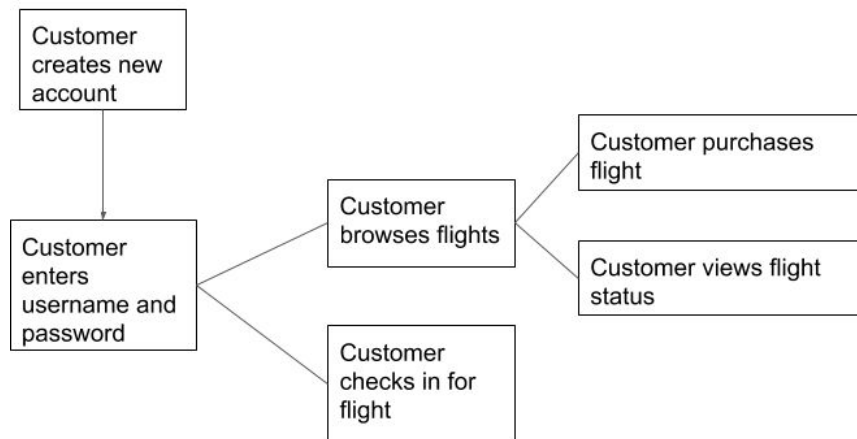
Scheduling Flights



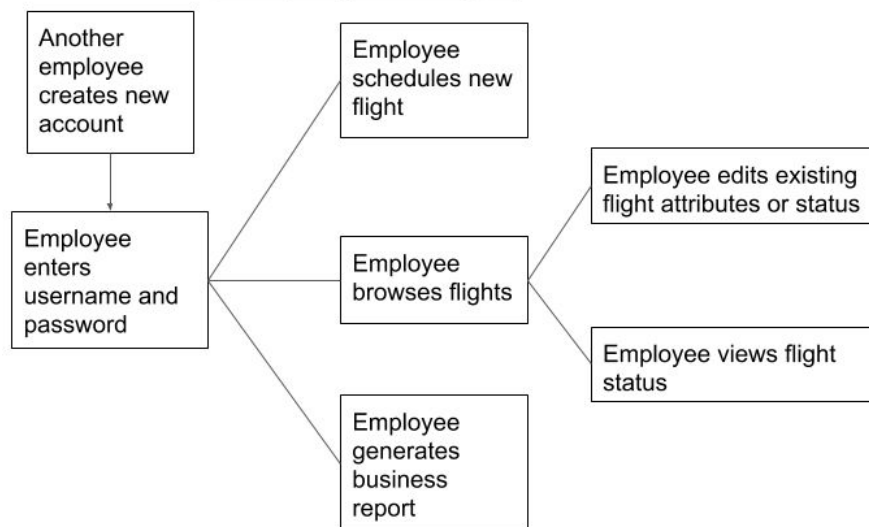
Purchasing Flights



Customer Login



Employee Login



6. Iterations and Deadlines

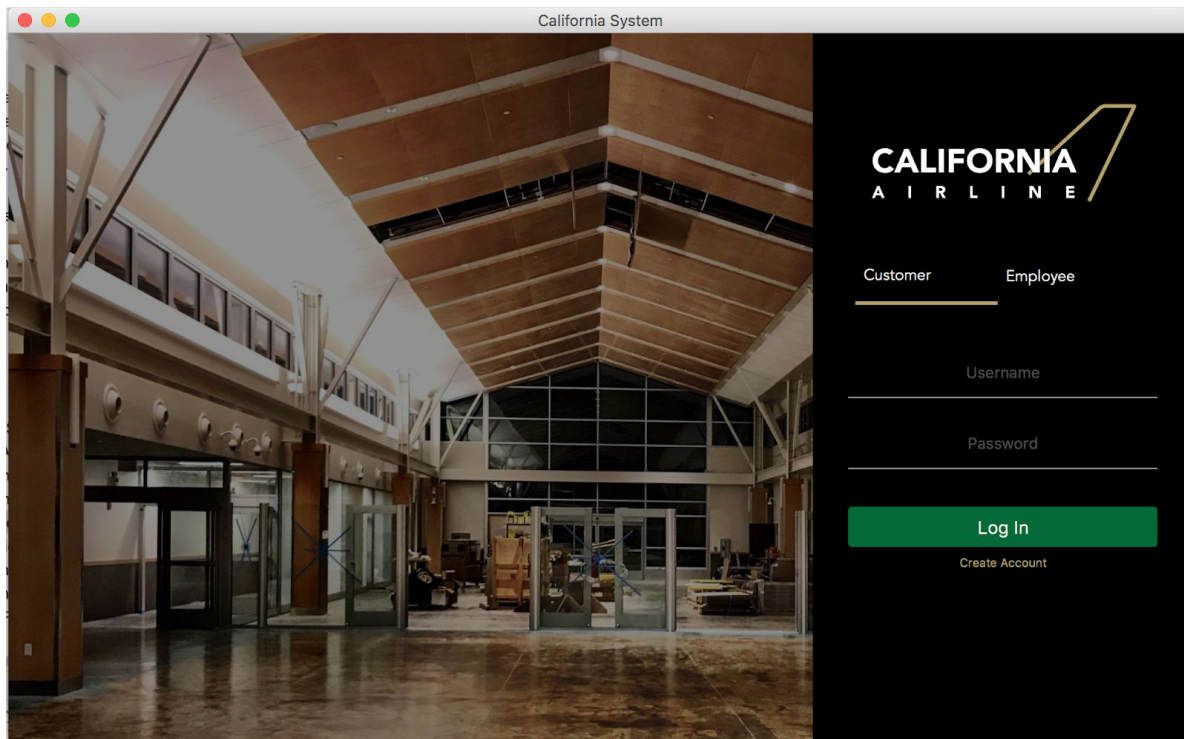
<u>Date</u>	<u>Description</u>
April 26th, 2018	Completion of Formal Requirements Document.
May 10th, 2018	Completion of First Software Iteration and First Iteration Documentation. Software will function from the command line using text files.
May 24th, 2018	Completion of Second Software Iteration and Second Iteration Documentation. Software GUI will be implemented. Note: This deadline was cancelled.
June 7th, 2018	Completion of Final Software Iteration and Third Iteration Documentation. Software database will be implemented.

7. User Interface Wireframe

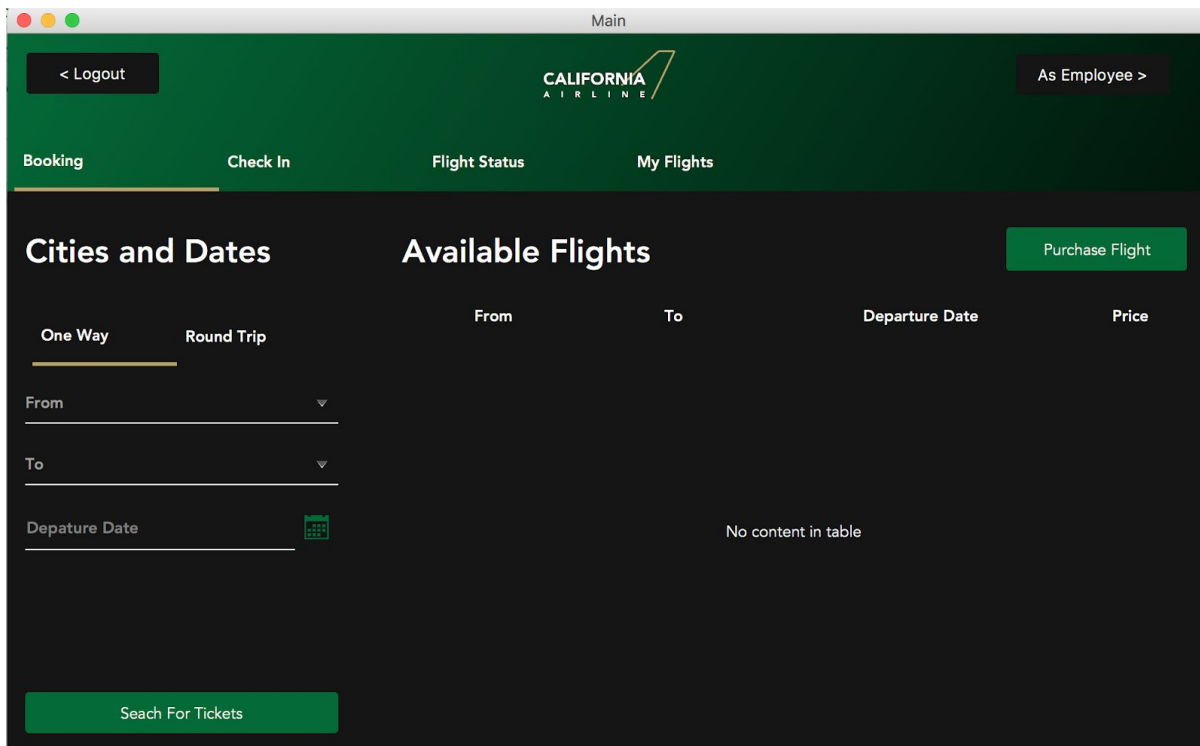
The following are high fidelity interface wireframes that reflects the use cases depicted in Section 2. The design reflects California Airline's color code of Green (PMS 343 C) and Gold (PMS 4515 C).

7a. Customer Interface Wireframe

- Customer - Login



- Customer - Book flight (Choosing flight schedule)



- Customer - Book flight (Payment and confirmation)

Confirm Ticket

< Back

CALIFORNIA AIRLINE

Select your seat

Departure Flight Available Seats ▼

Payment Information

Credit Card Number CSV

Expiration Date

Full Name

Billing Address

City State

Zip Code

Confirm Payment

- Customer - Check-in (Confirmation Number and Agreement)

Main

< Logout

CALIFORNIA AIRLINE

As Employee >

Booking Check In Flight Status My Flights

Enter Flight Number

Flight ID (e.g., 1, 2, 3)

By clicking "Check In", you are agreeing to the TSA Flight Safety Agreement.

Check In

TSA Flight Safety Agreement

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- Customer - Check-in (Baggage and Boarding Pass)

The screenshot shows a web browser window with the title 'Declare Baggage'. On the left is a dark green sidebar with the 'CALIFORNIA AIRLINE' logo. The main content area has a dark background. At the top left of the main area is a '< Back' button. The title 'Baggage Declaration' is centered. Below it are four input fields: 'How many carry on?' with a text input, 'Weight per carry on (lbs)' with a text input and 'Lbs.' label, 'How many will you check in?' with a text input, and 'Weight per check in' with a text input and 'Lbs.' label. At the bottom is a large green button labeled 'Confirm Check In'.

- Customer - Flight Status

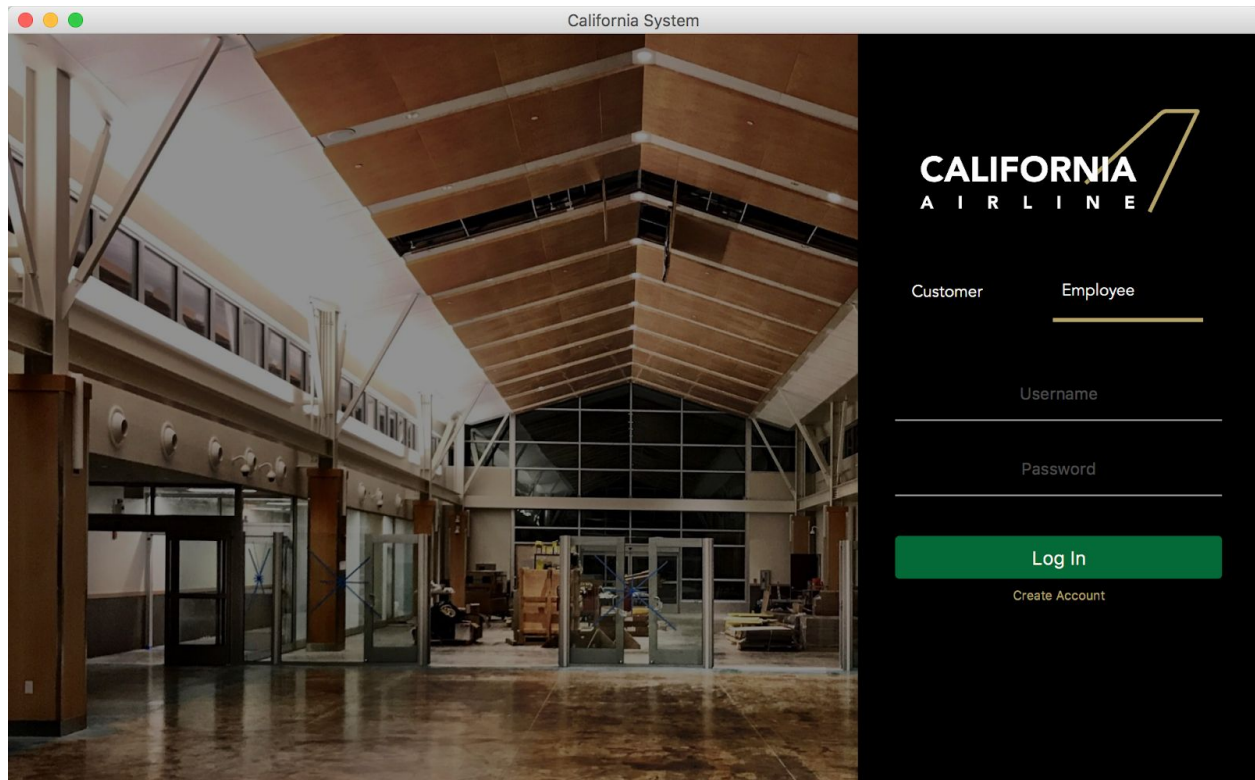
The screenshot shows a web browser window with the title 'Main'. The top navigation bar is dark green with a '< Logout' button on the left, the 'CALIFORNIA AIRLINE' logo in the center, and an 'As Employee >' button on the right. Below the navigation bar are four tabs: 'Booking', 'Check In', 'Flight Status' (which is active and underlined), and 'My Flights'. The main content area has a dark background. On the left is a section titled 'Enter Flight ID' with a text input containing '1001' and a green button labeled 'View Flight Status'. To the right is a section titled 'Flight Status' containing a table.

From	To	Departure Date	Status
San Luis Obispo	Phoenix	Wed, 09 May 17:00:00 PDT 2018	On-time

At the bottom of the table is a horizontal scrollbar.

7b. Employee Interface Wireframe

- Employee - Login



- Employee - Ticket Pricing Recommendation

The screenshot shows a web application interface for California Airline. The top navigation bar is dark green with a white logo and a '< Logout' button. Below it, a horizontal menu has five items: 'Available Flights', 'Pricing & Scheduling' (highlighted with a yellow underline), 'Flight Status', 'Report', and 'Employee Management'. The main content area is dark gray. On the left, under 'Flight Informations', there are four input fields: 'San Luis Obispo' (with a dropdown arrow), 'Phoenix' (with a dropdown arrow), '5/9/2018' (with a calendar icon), and '12:00 PM' (with a clock icon). Below these is a text input field containing '100' and a note: '(Base price will be adjusted using the previous two weeks of flight information)'. At the bottom left is a green 'Set Flight' button. On the right, under 'Flight is all set!', there is a list of flight details: 'Flight Id: 2001', 'From: San Luis Obispo', 'To: Phoenix', 'Date: 2018-05-09', 'Time: 12:00', and 'Adjusted Price: 82.23214285714286'.

- Employee - Check Flight Status

The screenshot shows the same web application interface, but with the 'Flight Status' menu item highlighted with a yellow underline. The main content area is dark gray. On the left, under 'Enter Flight ID', there is a text input field containing '1001', a green 'Search Flights' button, a dropdown menu showing 'Delayed', and a green 'Change Flight Status' button. On the right, under 'Flight Status', there is a table with four columns: 'From', 'To', 'Departure Date', and 'Status'. The table contains one row of data: 'San Luis Obispo', 'Phoenix', 'Wed, 09 May 17:00:00 PDT 2018', and 'On-time'.

- Employee - Schedule Flight (with conflict)

The screenshot shows a web application interface for an airline employee. The top navigation bar is dark green with a white 'Main' label on the right. On the left, there is a '< Logout' button. The center of the bar features the 'CALIFORNIA AIRLINE' logo. On the right, there is an 'As Customer >' button. Below the navigation bar, there are five tabs: 'Available Flights', 'Pricing & Scheduling' (which is highlighted with a yellow underline), 'Flight Status', 'Report', and 'Employee Management'. The main content area is divided into two columns. The left column, titled 'Flight Informations', contains a form with the following fields: 'San Luis Obispo' (with a dropdown arrow), 'Phoenix' (with a dropdown arrow), '5/9/2018' (with a calendar icon), '12:00 PM' (with a clock icon), and '100'. Below these fields is a note: '(Base price will be adjusted using the previous two weeks of flight information)'. At the bottom of this column is a red error message: 'Flight must not be within 40 minutes of another flight'. A green 'Set Flight' button is located at the bottom of the left column. The right column, titled 'Flight is all set!', displays the following information: 'Flight Id: 2001', 'From: San Luis Obispo', 'To: Phoenix', 'Date: 2018-05-09', 'Time: 12:00', and 'Adjusted Price: 82.23214285714286'.

8. Glossary

Account - username and password which allows a user to access the software and perform certain tasks

Arrival - the time a flight arrives

Baggage Policy - number of allowed bags and cost for these bags

Board - get onto plane

Boarding pass - paper that contains a code that a passenger needs to board a plane

Check in - customer logs on and confirms that they are planning to get on a flight and receives a boarding pass

Clearance - amount of time needed between planes on a runway

Departure - the time a flight leaves

Flight - a plan trip from one airport to another

Flight status - whether a flight is on time, delayed, or canceled

Passenger - a customer on board a flight

Round trip - a series of two flights to and then from a destination

Runway - an open space where the plane takes off and lands