

# Functional Specification

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**Team Name:** Cloud Nine

**Team Members:** Jeremy Maas, Matt Burton, McHale Trotter, Kevin Sampson, Justin Chen, Ryan Hirscher

## Table of Contents

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- [Introduction](#)
- [Naming Conventions](#)
- [Module Information](#)
  - [populate-aircraft-table.sql](#)
  - [populate-airports-table.sql](#)
  - [populate-flights-table.sql](#)
  - [schema.sql](#)
  - [maintenance\\_exception.py](#)
  - [aircraft\\_menu.py](#)
  - [airport\\_menu.py](#)
  - [configuration\\_menu.py](#)
  - [cost\\_menu.py](#)
  - [simulation\\_menu.py](#)
  - [timetable\\_menu.py](#)
  - [aircraft.py](#)
  - [airport.py](#)
  - [flight.py](#)
  - [aircraft\\_objects.py](#)
  - [airport\\_objects.py](#)
  - [report.py](#)
  - [schedule.py](#)
  - [scheduled\\_event.py](#)
    - [ScheduledEvent](#)
    - [DepartureEvent](#)
    - [ArrivalEvent](#)
  - [simulation\\_config.json](#)
  - [simulation.py](#)
  - [timetable.py](#)
  - [clock.py](#)
  - [database.py](#)
  - [display\\_menu.py](#)
  - [flight\\_angle.py](#)
  - [flight\\_demand.py](#)
  - [flight\\_duration.py](#)
  - [flight\\_takeoff.py](#)
  - [great\\_circle.py](#)
  - [turn\\_around\\_time.py](#)
  - [comfort\\_airlines.py](#)
- [Database](#)
  - [Tables](#)
    - [Aircraft Table](#)
    - [Airports Table](#)
    - [Flights Table](#)
- [Docker](#)
  - [docker-compose.yaml](#)
  - [Volumes](#)

- [MariaDB Data](#)
- [SQL Files](#)

## Introduction

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This document serves as a detailed introduction to the codebase highlighting the purpose and use of files, functions, schemas, and conditions involved in each. The overall codebase is written in Python, and the database in SQL.

## Naming Conventions

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Type	Example
Files	<code>this_file_name.py</code>
Functions/Methods	<code>this_function_name</code>
Classes	<code>ThisClassName</code>
@Properties	<code>property_name</code>
Local variables	<code>variableNames</code>
Private variables	<code>_underscorePrefixed</code>
Constants	<code>CONSTANT_NAME</code>
	<i>(Note: constants must go at the top of the file)</i>
Attributes	<code>attribute_name_convention</code>

## Module Information

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### populate-aircraft-table.sql

**Location:** comfort-airlines/docker/sql-files/populate-aircraft-table.sql

**Purpose:** Replaces the entities in the aircraft table with the hardcoded list of aircraft in this file.

**Execution:** Once inside the cloudnine database, ensure that the schema has been initialized, then run:

```
source /docker-entrypoint-initdb.d/populate-aircraft-table.sql
```

### populate-airports-table.sql

**Location:** comfort-airlines/docker/sql-files/populate-airports-table.sql

**Purpose:** Replaces the entities in the airports table with the hardcoded list of airports in this file.

**Execution:** Once inside the cloudnine database, ensure that the schema has been initialized, then run:

```
source /docker-entrypoint-initdb.d/populate-airports-table.sql
```

### populate-flights-table.sql

**Location:** comfort-airlines/docker/sql-files/populate-flights-table.sql

**Purpose:** Replaces the entities in the flights table with the hardcoded list of flights in this file.

**Execution:** Once inside the cloudnine database, ensure that the schema has been initialized, then run:

```
source /docker-entrypoint-initdb.d/populate-flights-table.sql
```

### schema.sql

**Location:** comfort-airlines/docker/sql-files/schema.sql

**Purpose:** Empties and replaces the existing tables with the database schema as defined in this file.

**Execution:** Once inside the cloudnine database, initialize the schema by running:

```
source /docker-entrypoint-initdb.d/schema.sql
```

## maintenance\_exception.py

**Location:** comfort-airlines/exceptions/maintenance\_exception.py

**Purpose:** Handles error logging for invalid maintenance calls

## aircraft\_menu.py

**Location:** comfort-airlines/menus/aircraft\_menu.py

**Purpose:** Responsible for implementing the menu options under the aircraft menu option

Method Name	Purpose	Parameters	Return Values
<code>view_aircraft()</code>	Prints the aircraft entities from the aircraft table	None	None
<code>print_aircrafts_header()</code>	Formats and prints the column headers for aircraft attributes	None	None
<code>print_aircraft(aircraft)</code>	Formats and prints the information of the aircraft object passed in	<code>aircraft</code> : dataframe row	None
<code>edit_aircraft()</code>	Displays the list of editing options	None	None
<code>add_aircraft()</code>	Adds an aircraft to the database from user input	None	None
<code>remove_aircraft()</code>	Prints the aircraft table and then allows user to remove an aircraft by tail_number	None	None
<code>get_valid_tail_number()</code>	Returns valid tail_number from user input or 'quit' if the user cancels	None	str or 'quit'
<code>get_valid_name_or_model(input_type)</code>	Returns valid string from user input or 'quit' if the user cancels	<code>input_type</code> : str	str or 'quit'
<code>get_int_value(input_type)</code>	Returns valid integer value from user input or 'quit' if the user cancels	<code>input_type</code> : str	int or 'quit'

## airport\_menu.py

**Location:** comfort-airlines/menus/airport\_menu.py

**Purpose:** Responsible for implementing the menu options under the airport menu option

Method Name	Purpose	Parameters	Return Values
<code>view_airports()</code>	Queries the database for the airports table and prints the entities	None	None
<code>print_airports_header()</code>	Formats and prints the column headers for airport attributes	None	None
<code>print_airport(airport)</code>	Formats and prints the information of the airport object passed in	<code>airport</code> : dataframe row	None
<code>edit_airport()</code>	Displays the list of editing options	None	None
<code>add_airport()</code>	Adds an airport to the database from user input	None	None
<code>remove_airport()</code>	Prints the airport table and then allows user to remove an airport by abbreviation	None	None
<code>get_valid_name()</code>	Returns valid airport name from user input or 'quit' if the user cancels	None	str or 'quit'
<code>get_valid_abbreviation(removingAirport)</code>	Returns valid airport abbreviation from user input or 'quit' if the user cancels. If removingAirport is True, checks if abbreviation exists in the database	<code>removingAirport</code> : bool	str or 'quit'
<code>get_valid_latitude()</code>	Returns valid latitude from user input or 'quit' if the user cancels	None	float or 'quit'

Method Name	Purpose	Parameters	Return Values
get_valid_longitude()	Returns valid longitude from user input or 'quit' if the user cancels	None	float or 'quit'
get_valid_timezone_offset()	Returns valid timezone offset from user input or 'quit' if the user cancels	None	int or 'quit'
get_valid_metro_population()	Returns valid metro population from user input or 'quit' if the user cancels	None	int or 'quit'
get_valid_is_hub()	Returns valid is_hub value from user input or 'quit' if the user cancels	None	int or 'quit'
get_valid_total_gates(metroPopulation, isHub)	Returns valid total gates value from user input or 'quit' if the user cancels. Calculates maximum possible gates based on metroPopulation and isHub values	metroPopulation : int, isHub : int	int or 'quit'

configuration\_menu.py

**Location:** comfort-airlines/menus/configuration\_menu.py  
**Purpose:** Responsible for implementing the menu options under the configure simulation menu option

Method Name	Purpose	Parameters	Return Values
read_config()	Returns the simulation configuration from the JSON file	None	dict
write_config(config)	Writes the simulation configuration to the JSON file	config : dict	None
configure_start_date()	Configures the start date of the simulation	None	None
configure_duration()	Configures the duration of the simulation	None	None
configure_report_frequency()	Configures the report frequency of the simulation	None	None
get_report_frequency_options(duration)	Determines the available report frequency options based on the duration of the simulation	duration : int	list
format_options_for_print(options)	Formats the report frequency options for display	options : list	str
ensure_valid_report_frequency(config, duration)	Ensures that the selected report frequency is valid based on the duration of the simulation	config : dict, duration : int	str
configure_costs()	Displays the costs submenu	None	None

cost\_menu.py

**Location:** comfort-airlines/menus/cost\_menu.py  
**Purpose:** Responsible for implementing the menu options under the configure costs menu option

Method Name	Purpose	Parameters	Return Values
read_config()	Returns the simulation configuration from the JSON file	None	dict
write_config(config)	Writes the simulation configuration to the JSON file	config : dict	None
configure_fuel_cost()	Configures the fuel cost for the simulation	None	None
configure_takeoff_cost()	Configures the takeoff cost for the simulation	None	None
configure_landing_cost()	Configures the landing cost for the simulation	None	None
configure_leasing_costs()	Configures the leasing costs for different aircraft models	None	None

Method Name	Purpose	Parameters	Return Values
retrieve_aircraft_models_and_costs()	Retrieves the aircraft models and their leasing costs from the database	None	dataframe
display_aircraft_models_and_costs(dataframe)	Displays the current leasing costs for each aircraft model	dataframe : dataframe	None
handle_model_input(leasingCosts)	Handles user input for selecting an aircraft model	leasingCosts : dict	str
handle_leasing_cost_input(model, leasingCosts, config)	Handles user input for updating the leasing cost of an aircraft model	model : str, leasingCosts : dict, config : dict	None
update_leasing_costs_in_database(leasingCosts)	Updates the leasing costs of aircraft models in the database	leasingCosts : dict	None
is_valid_dollar_value(inputString)	Checks if the input string represents a valid dollar value	inputString : str	bool

simulation\_menu.py

**Location:** comfort-airlines/menus/simulation\_menu.py  
**Purpose:** Responsible for implementing the menu options under the simulation menu option

Method Name	Purpose	Parameters	Return Values
run_simulation()	Runs the simulation	None	None
configure_simulation()	Displays the menu for configuring simulation options	None	None
analyze_simulation()	Displays the analyze simulation submenu	None	None
analyze_follow_aircraft()	Prints 'Executing analyze_follow_aircraft()'	None	None
analyze_download_reports()	Prints 'Executing analyze_download_reports()'	None	None

timetable\_menu.py

**Location:** comfort-airlines/menus/timetable\_menu.py  
**Purpose:** Responsible for implementing the menu options under the timetable main menu option

Method Name	Purpose	Parameters	Return Values
view_timetable()	Displays the timetable	None	None
search_routes()	Prints 'Executing search_routes()'	None	None
edit_timetable()	Displays the edit timetable submenu	None	None
download_timetable()	Prints 'Executing download_timetable()'	None	None
sort_by_cost()	Prints 'Executing sort_by_cost()'	None	None
sort_by_number_of_stops()	Prints 'Executing sort_by_number_of_stops()'	None	None
sort_by_departure_time()	Prints 'Executing sort_by_departure_time()'	None	None
add_flight()	Prints 'Executing add_flight()'	None	None
remove_flight()	Prints 'Executing remove_flight()'	None	None
upload_timetable()	Prints 'Executing upload_timetable()'	None	None

aircraft.py

**Location:** comfort-airlines/objects/aircraft.py  
**Purpose:** Represents aircraft objects in the simulation. Important for tracking the dynamic information of each aircraft

Attribute Name	Type	Unit
<code>_id</code>	int	
<code>_tailNumber</code>	string	
<code>_name</code>	string	
<code>_model</code>	string	
<code>_maximumSpeed</code>	int	mph
<code>_maximumCapacity</code>	int	passengers
<code>_maximumFuel</code>	int	gallons
<code>_currentFuel</code>	int	gallons
<code>_cargoVolume</code>	int	cubic feet
<code>_leasingCost</code>	int	USD
<code>_timeSinceLastMaintenance</code>	int	minutes
<code>_requiresMaintenance</code>	bool	

Method Name	Purpose	Parameters	Return Values
<code>timeSinceLastMaintenance(self, durationOfLastFlight)</code>	Set the time since last maintenance and updates the requires maintenance value	<code>self : aircraft,</code> <code>durationOfLastFlight : int</code>	None

airport.py

**Location:** comfort-airlines/objects/airport.py  
**Purpose:** Represents airport objects in the simulation. Important for tracking the dynamic information of each airport

Attribute Name	Type	Unit
<code>_id</code>	int	
<code>_name</code>	string	
<code>_abbreviation</code>	string	
<code>_latitude</code>	float	degrees
<code>_longitude</code>	float	degrees
<code>_timezoneOffset</code>	int	hours
<code>_metroPopulation</code>	int	people
<code>_totalGates</code>	int	
<code>_availableGates</code>	int	
<code>_isHub</code>	int	binary

Method Name	Purpose	Parameters	Return Values
<code>remove_gate(self)</code>	Attempts to increase the avaialable gates by one	<code>self : airport</code>	None

<code>add_gate(self)</code>	Attempts to decrease the available gates by one	<code>self : airport</code>	None
Method Name	Purpose	Parameters	Return Values

flight.py

**Location:** comfort-airlines/objects/flight.py  
**Purpose:** Used to mirror the flights in the database and update their values during the simulation

Attribute Name	Type	Unit
<code>_id</code>	int	
<code>_number</code>	string	
<code>_aircraftID</code>	int	
<code>_departureAirportID</code>	int	
<code>_destinationAirportID</code>	int	
<code>_angleOfFlight</code>	float	degrees
<code>_duration</code>	int	minutes
<code>_departureTime</code>	int	minutes
<code>_arrivalTime</code>	int	minutes
<code>_onTimeBin</code>	int	binary

Method Name	Purpose	Parameters	Return Values
<code>duration(self, duration)</code>	Sets the flight duration and the arrival time	<code>self : flight</code> , <code>duration : int</code>	None
<code>arrivalTime(self, newArrivalTime)</code>	Sets the arrival time and updates the on time value	<code>self : flight</code> , <code>duration : int</code>	None

aircraft\_objects.py

**Location:** comfort-airlines/simulation/aircraft\_objects.py  
**Purpose:** Create and store a dictionary of aircraft objects used in the simulation to manage their dynamic information  
**Global Variable:** `aircrafts` : dictionary containing all of the aircraft objects in the simulation

Method Name	Purpose	Parameters	Return Values
<code>create_aircrafts_from_database()</code>	Returns the aircraft entities from the database in a dictionary	None	<code>dict</code>

airport\_objects.py

**Location:** comfort-airlines/simulation/airport\_objects.py  
**Purpose:** Create and store a dictionary of airport objects used in the simulation to manage their dynamic information  
**Global Variable:** `airports` : dictionary containing all of the airport objects in the simulation

Method Name	Purpose	Parameters	Return Values
<code>create_airports_from_database()</code>	Returns the airport entities from the database in a dictionary	None	<code>dict</code>

report.py

**Location:** comfort-airlines/simulation/report.py  
**Purpose:** Generates reports about the simulation

Method Name	Purpose	Parameters	Return Values
<code>handle_report(config, minutes)</code>	Handles report errors and calls the <code>generate_report()</code> function	<code>config : dict</code> , <code>minutes : int</code>	None
<code>should_generate_report(config, minutes)</code>	Returns true if the simulation time and report frequency align to generate a report	<code>config : dict</code> , <code>minutes : int</code>	<code>bool</code>
<code>generate_report()</code>	Prints 'Executing generate_report()'	None	None
<code>is_start_of_day(minutes)</code>	Returns true if minutes is the start of a day	<code>minutes : int</code>	<code>bool</code>
<code>is_start_of_week(minutes)</code>	Returns true if minutes is the start of a week	<code>minutes : int</code>	<code>bool</code>
<code>is_start_of_month(minutes)</code>	Returns true if minutes is the start of a month	<code>minutes : int</code>	<code>bool</code>
<code>is_start_of_year(minutes)</code>	Returns true if minutes is the start of a year	<code>minutes : int</code>	<code>bool</code>
<code>is_end_of_simulation(config, minutes)</code>	Returns true if minutes is the end of the simulation	<code>config : dict</code> , <code>minutes : int</code>	<code>bool</code>

### schedule.py

**Location:** comfort-airlines/simulation/schedule.py  
**Purpose:** Stores a singleton list of all simulation events and at what times they occur

Method Name	Purpose	Parameters	Return Values
<code>get_instance(cls)</code>	Used for retrieving the singleton instance of the schedule	<code>cls : Schedule</code>	<code>Schedule</code>
<code>clear_schedule(self)</code>	Removes all events from the schedule	<code>self : Schedule</code>	None
<code>add_event(self, event)</code>	Appends an event to the schedule at the time of the event	<code>self : Schedule</code> , <code>event : ScheduledEvent</code>	None
<code>get_events_for_minute(self, minute)</code>	Returns the list of events at a given time	<code>self : Schedule</code> , <code>minute : int</code>	<code>list</code>

### scheduled\_event.py

**Location:** comfort-airlines/simulation/scheduled\_event.py  
**Purpose:** Handle various event types, storing references to the associated information

#### Scheduled Event Class

Method Name	Purpose	Parameters	Return Values
<code>__init__(self, eventType, time)</code>	Event constructor	<code>self : ScheduledEvent</code> , <code>eventType : string</code> , <code>time : int</code>	None
<code>execute(self)</code>	Does nothing by default. Override for each event	<code>self : ScheduledEvent</code>	None

#### Departure Event Class

Method Name	Purpose	Parameters	Return Values
<code>__init__(self, flight)</code>	Creates the ScheduledEvent, and stores references to aircraft and airport involved in departure	<code>self : DepartureEvent</code> , <code>flight : Flight</code>	None
<code>execute(self)</code>	Returns an event string stating which aircraft departs from which airport	<code>self : DepartureEvent</code>	<code>string</code>



Arrival Event Class

Method Name	Purpose	Parameters	Return Values
<code>__init__(self, flight)</code>	Creates the ScheduledEvent, and stores references to aircraft and airport involved in arrival	<code>self : ArrivalEvent</code> , <code>flight : Flight</code>	None
<code>execute(self)</code>	Returns an event string stating which aircraft arrives at which airport	<code>self : ArrivalEvent</code>	<code>string</code>

simulation\_config.json

**Location:** comfort-airlines/simulation/simulation\_config.json  
**Purpose:** JSON Dictionary to store the data relating to the simulation configuration options accessible to the user

Value Name	Use	Default Value
<code>startDate</code>	Sets the day that the simulation begins	<code>0</code>
<code>reportFrequency</code>	Sets the interval that reports are generated	<code>final</code>
<code>fuelCost</code>	Sets the price of fuel per gallon	<code>6.19</code>
<code>takeoffCost</code>	Sets the price per each aircraft takeoff	<code>2000</code>
<code>landingCost</code>	Sets the price for each aircraft landing	<code>2000</code>
<code>leasingCost</code>	Sets the leasing cost of each aircraft model type per month	<code>737-600 : 245000</code> , <code>737-800 : 270000</code> , <code>A200-100 : 192000</code> , <code>A220-300 : 228000</code>

simulation.py

**Location:** comfort-airlines/simulation/simulation.py  
**Purpose:** Implements the functionality of the user options from the Simulation section of the main menu

Method Name	Purpose	Parameters	Return Values
<code>run_simulation()</code>	Runs the main simulation loop and executes events for each minute of the simulation's duration	None	None
<code>populate_schedule_from_timetable(schedule)</code>	Resets the event schedule with departure and arrival events based on the flights in the timetable	<code>schedule : Schedule</code>	<code>Schedule</code>
<code>create_timetable_from_database()</code>	Returns a dictionary containing every flight from the flights table in the database	None	<code>dict</code>
<code>get_simulation_configuration()</code>	Returns the simulation configuration from the JSON file	None	<code>dict</code>

generate-timetable.py

**Location:** comfort-airlines/timetable/generate-timetable.py  
**Purpose:** Produce a list of flights abiding by gate constraints which fly through at least one hub each day

Method Name	Purpose	Parameters	Return Values
<code>place_aircrafts()</code>	Allocates all aircraft to an airport	None	None
<code>generate()</code>	Generates an aircraft's flight path for the entire day	None	None
<code>nearest_home()</code>	Finds the nearest airport that requires more aircraft of this model	None	<code>Airport</code>
<code>choose_random_airport(startAirport, CountToHub, aircraft, CurrentTime)</code>	Returns a random suitable airport	<code>startAirport : Airport</code> , <code>CountToHub : int</code> , <code>aircraft : Aircraft</code> , <code>CurrentTime : int</code>	<code>Airport</code>

## timetable.py

**Location:** comfort-airlines/timetable/timetable.py

**Purpose:** Implements the functionality of the user options from the Timetable section of the main menu

Method Name	Purpose	Parameters	Return Values
<code>view_timetable()</code>	Prints the table of all flights from the database	None	None
<code>print_timetable_header()</code>	Formats and prints the column headers for flight attributes	None	None
<code>print_flight(flight)</code>	Formats and prints the information of the flight object passed in	<code>flight : dataframe</code> <code>row</code>	None

## clock.py

**Location:** comfort-airlines/utilities/clock.py

**Purpose:** Print the simulation time in various formats

Method Name	Purpose	Parameters	Return Values
<code>get_time(minutes)</code>	Converts minutes to days, hours, and minutes	<code>minutes : int</code>	<code>days : int</code> , <code>hours : int</code> , <code>minutes : int</code>
<code>print_time(minutes)</code>	Returns minutes in a human readable format of day and time	<code>minutes : int</code>	<code>string</code>
<code>get_flight_time(minutes)</code>	Used in <code>view_timetable()</code> and returns just the hours and minutes in human readable format	<code>minutes : int</code>	<code>string</code>

## database.py

**Location:** comfort-airlines/utilities/database.py

**Purpose:** API for interfacing with the database

Method Name	Purpose	Parameters	Return Values
<code>connect(self)</code>	Establishes a connection to the database	<code>self : Database</code>	None
<code>disconnect(self)</code>	Closes the database connection	<code>self : Database</code>	None
<code>execute_query(self, query, params=None)</code>	Executes the given SQL query	<code>self : Database</code> , <code>query : string</code> , <code>params : sequence</code>	<code>cursor</code>
<code>execute_query_to_dataframe(self, query, params=None)</code>	Executes the given SQL query and returns results as a pandas DataFrame	<code>self : Database</code> , <code>query : string</code> , <code>params : sequence</code>	<code>dataframe</code>
<code>execute_insert_update_delete_query(self, query, params=None)</code>	Executes INSERT, UPDATE, or DELETE SQL query	<code>self : Database</code> , <code>query : string</code> , <code>params : sequence</code>	None

## display\_menu.py

**Location:** comfort-airlines/utilities/display\_menu.py

**Purpose:** Displays lists of options and handles user input for selecting an option

Method Name	Purpose	Parameters	Return Values
<code>display_menu(menu, is_submenu=False)</code>	Displays an enumerated list of menu options and handles user input for option selection	<code>menu : dict</code> , <code>is_submenu : bool</code>	None

## flight\_angle.py

**Location:** comfort-airlines/utilities/flight\_angle.py

**Purpose:** Returns % of base flight time that a flight will take based on wind and bearing angle

Method Name	Purpose	Parameters	Return Values
<code>calculate_percentage(startAirport, endAirport, wind = .045)</code>	Returns a float to multiply with flight time to find the actual time the flight will take	<code>startAirport : Airport,</code> <code>endAirport : Airport, wind : float</code>	<code>float</code>

### flight\_demand.py

**Location:** comfort-airlines/utilities/flight\_demand.py  
**Purpose:** Returns number of people flying from Airport A to Airport B based on metro population

Method Name	Purpose	Parameters	Return Values
<code>individual_demand(startingAirport, endingAirport)</code>	Returns number of people flying from Airport A to Airport B based on metro population	<code>startingAirport : Airport,</code> <code>endingAirport : Airport</code>	<code>int</code>

### flight\_duration.py

**Location:** comfort-airlines/utilities/flight\_duration.py  
**Purpose:** Calculates the duration of flights based on aircraft models, airport locations, and flight angles

Method Name	Purpose	Parameters	Return Values
<code>calculate_flight_duration(aircraft, departureAirport, destinationAirport)</code>	Returns the time in minutes for an aircraft to get from its departure airport to its destination	<code>aircraft : Aircraft,</code> <code>departureAirport : Airport,</code> <code>destinationAirport : Airport</code>	<code>int</code>
<code>calculate_total_flight_duration(aircraft, departureAirport, destinationAirport, refueling = False)</code>	Returns the time in minutes for an aircraft to get from its departure airport to its destination and turn around for its next flight	<code>aircraft : Aircraft,</code> <code>departureAirport : Airport,</code> <code>destinationAirport : Airport,</code> <code>refueling : bool</code>	<code>int</code>

### flight\_takeoff.py

**Location:** comfort-airlines/utilities/flight\_takeoff.py  
**Purpose:** Calculates the time for an aircraft to reach cruising altitude or descend form cruising altitude

Method Name	Purpose	Parameters	Return Values
<code>calculate_acceleration_time(cruisingAltitude, maxSpeed)</code>	Calculates the time it takes to fly and get into cruising altitude then to reach max speed	<code>cruisingAltitude : int,</code> <code>maxSpeed : int</code>	<code>int</code>
<code>calculate_descent_time(distance)</code>	Calculates the time to land using the aircraft's distance away from it's destination	<code>distance : float</code>	<code>int</code>

### great\_circle.py

**Location:** comfort-airlines/utilities/great\_circle.py  
**Purpose:** Returns the distance in miles between two airports

Method Name	Purpose	Parameters	Return Values
<code>great_circle(airportOne, airportTwo)</code>	Returns the distance in miles between two airports	<code>airportOne : Airport,</code> <code>airportTwo : Airport</code>	<code>float</code>

### turn\_around\_time.py

**Location:** comfort-airlines/utilities/turn\_around\_time.py  
**Purpose:** Returns the minimum amount of time in minutes that an aircraft must wait before taking off for its next flight

Method Name	Purpose	Parameters	Return Values

Method Name	Purpose	Parameters	Return Values
turn_around_time(aircraftNeedsRefuel)	Returns the minimum amount of time in minutes that an aircraft must wait before taking off for its next flight	aircraftNeedsRefuel:	int

comfort\_airlines.py

**Location:** comfort-airlines/comfort\_airlines.py  
**Purpose:** The main executable program for the user interface. Responsible for displaying the main menu and calling the corresponding methods. **Execution:** In the comfort-airlines directory, run the following command in the terminal to run the main executable:

```
python3 comfort_airlines.py
```

Database

Tables

Tables_in_cloudnine
aircraft
airports
flights

Aircraft Table

| Field | Type | Null | Key | Default | Extra | +-----+-----+-----+-----+ | aircraft\_id | int(11) | NO | PRI | NULL | auto\_increment | | tail\_number | varchar(20) | YES | | NULL | | | name | varchar(255) | YES | | NULL | | | model | varchar(255) | YES | | NULL | | | maximum\_speed | int(11) | YES | | NULL | | | maximum\_capacity | int(11) | YES | | NULL | | | maximum\_fuel | int(11) | YES | | NULL | | | cargo\_volume | int(11) | YES | | NULL | | | leasing\_cost | int(11) | YES | | NULL | |

Airports Table

| Field | Type | Null | Key | Default | Extra | +-----+-----+-----+-----+ | airport\_id | int(11) | NO | PRI | NULL | auto\_increment | | name | varchar(255) | YES | | NULL | | | abbreviation | varchar(3) | YES | | NULL | | | latitude | float | YES | | NULL | | | longitude | float | YES | | NULL | | | timezone\_offset | int(11) | YES | | NULL | | | metro\_population | int(11) | YES | | NULL | | | total\_gates | int(11) | YES | | NULL | | | is\_hub | binary(1) | YES | | NULL | |

Flights Table

| Field | Type | Null | Key | Default | Extra | +-----+-----+-----+-----+ | flight\_id | int(11) | NO | PRI | NULL | auto\_increment | | flight\_number | varchar(20) | YES | | NULL | | | aircraft\_id | int(11) | YES | MUL | NULL | | | departure\_airport\_id | int(11) | YES | MUL | NULL | | | destination\_airport\_id | int(11) | YES | MUL | NULL | | | angle\_of\_flight | float | YES | | NULL | | | duration | int(11) | YES | | NULL | | | departure\_time | int(11) | YES | | NULL | | | arrival\_time | int(11) | YES | | NULL | |

Docker

**Location:** comfort-airlines/docker/  
**Purpose:** Containerizes the database for cross platform compatibility  
**Connection:** To connect to the running docker container execute the following command in the terminal:

```
docker exec -it mariadb-container mariadb -u admin -p cloudnine
```

docker-compose.yaml

**Location:** comfort-airlines/docker/docker-compose.yaml  
**Purpose:** Configurations for docker are listed in here which are parsed when to composing up an instance with key value pairs. This specifies the volumes to mount for SQL files and MariaDB data, environment values like database name and password prompt, and GUI for database.  
**Execution:** With the docker daemon running, this container not running, and the working directory being the comfort-airlines/docker/ directory, execute the following command in the terminal to start the docker container:

```
docker-compose up -d
```

Volumes

Volume directories are folders that are linked to the docker container for access within the container.

MariaDB Data

**Location:** comfort-airlines/docker/mariadb-data/  
**Purpose:** This directory is a volume connected to the docker used to store the database contents.

## SQL Files

**Location:** comfort-airlines/docker/sql-files/

**Purpose:** This directory is a volume connected to the docker so users can execute these files in the cloudnine database. These files are copied in into the *docker-entrypoint-initdb.d/* directory within the docker.

**Execution:** Execut the files in this folder by first connecting to the cloudnine database then executing the following command:

```
source docker-entrypoint-initdb.d/<file_name.sql>
```