Flight Planning Calculator

Use Case Model

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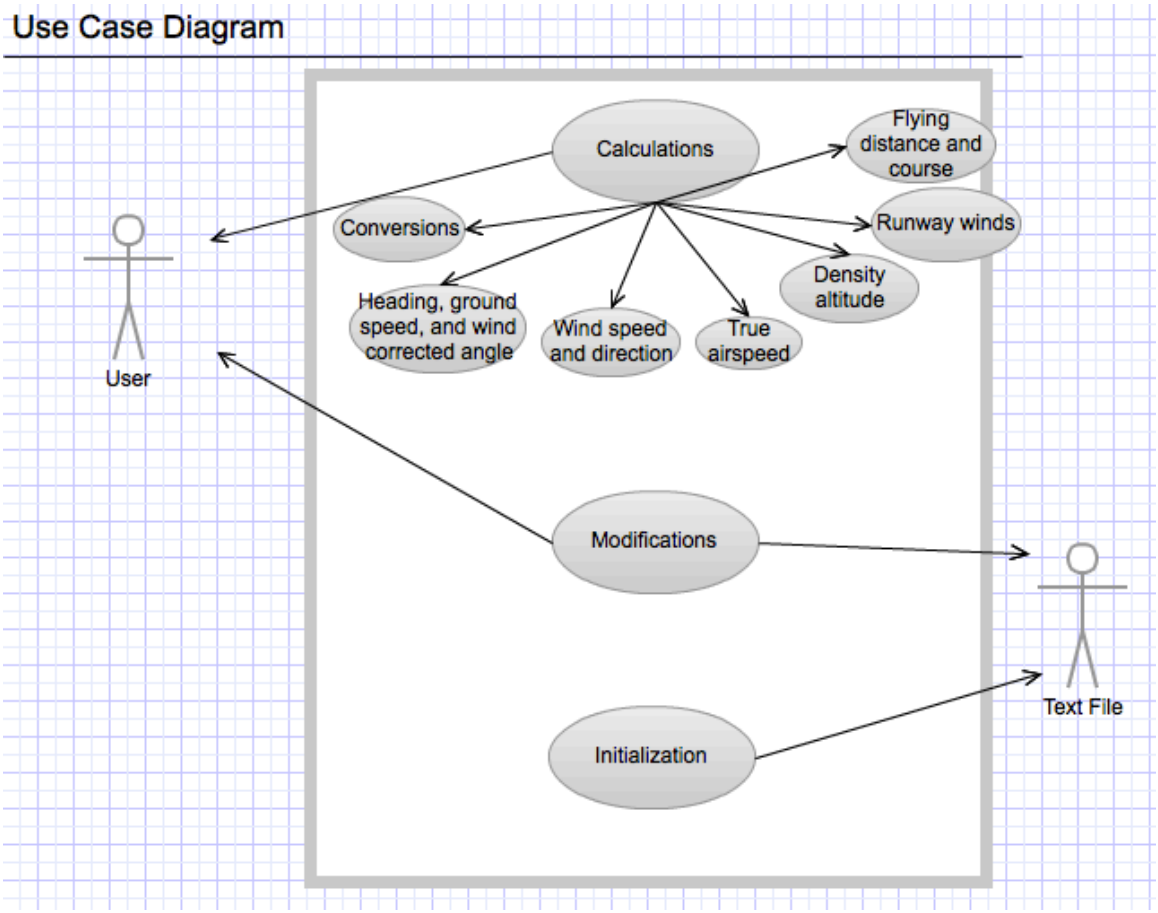
Introduction

This document is an addition to the *Flight Planning Calculator Requirements Specification*, developed by Mac Daddy Inc. As part of an analysis, the functional requirements will be contained in the Use Case Model. It includes a Use Case Diagram for the entire Flight Planning Calculator system. The diagram also shows the specific functions that it can complete. For each use case, a scenario description describes how actors interact with the system to carry out the use case functionality.

Flight Planning Calculator Users

- General User – The general user will actively be using the Flight Planning Calculator for their pre-flight and during flight operations. They can also make minor modification by choosing airport codes.
- Text File User – The text file user creates the files that the Flight Planning Calculator can read. They are able to make major modification by deleting and adding airport codes for the general user use.

Flight Planning Calculator Use Case Diagram



Flight Planning Calculator Use Cases and Test Cases

Use Case 1: Perform a conversion

Goal: Perform a conversion from one unit to another of the same unit class (e.g. distance, speed, temperature, angle, and pressure)
Actors: General user
Scenario: The user needs to convert a distance from miles to kilometers.

Test Case 1:

Input	**Output**
20 miles	32.19 km
-1 Kelvin	Error msg: Kelvin scale should be >=0
0 Kelvin	-273.15 degrees Celsius
1 Kelvin	1.8 Rankine
-274 degrees Celsius	Error msg: Celsius scale must be >= -273.15 degrees
50 km/h	27.00 knots
76 degrees 61 min	Error msg: Minutes must be < 60
76 degrees 59 min	1.34 radians

Use Case 2: Calculate heading, ground speed, and wind corrected angle

Goal: Calculate heading, ground speed, and wind corrected angle when the user provides the wind speed, true airspeed, and course
Actors: General user
Scenario: The user needs to determine his heading, ground speed, and wind corrected angle knowing his wind speed, true airspeed, and course

Test Case 2:

Input				**Output**		
Wind Speed	*Direction*	*True Airspeed*	*Course*	*Heading*	*Ground Speed*	*Correction Angle*
-10 knots	2 degrees	2 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
0 knots	2 degrees	-1 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
40 km/h	-2 degrees	2 km/h,	46 degrees	Error: Direction must be >1 and <=360 degrees	Error	Error
40	2 degrees	1 km/h	-46	Error: Course must be	Error	Error

km/h			degrees	>=0 and <360 degrees		
70 km/h	2 degrees	50 km/h	46 degrees	329 Degrees	39 km/h	103 degrees
40 knots	135 degrees	60 knots	30 degrees	70 degrees	56 km/h	40 degrees

Use Case 3: Calculate wind speed and direction

Goal: Calculate wind speed and direction when the user provides the ground speed, true airspeed, course, and heading
Actors: General user
Scenario: The user needs to determine his wind speed and direction knowing his ground speed, true airspeed, course, and heading

Test Case 3:

		Input			**Output**
Ground speed	*True airspeed*	*Course*	*Heading*	*Wind Speed*	Wind Direction
115 knots	100 knots	010 degrees	007 degrees	16 knots	209 degrees
115 knots	100 knots	-1 degrees	007 degrees	Error	Error msg: Direction
10 km/h	-1 km/h	0 degrees	010 degrees	Error	Error msg: Directions should be > 0 degrees and <360 degrees
10 km/h	5 km/h	361 degrees	010 degrees	Error	Error msg: Directions should be > 0 degrees and <360 degrees
-1 km/h	30 km/h	10 degrees	010 degrees	Error	Error msg: Speed must be >0 km/h
10 knots	15 knots	10 degrees	60 degrees	11.5 knots	138 degrees

Use Case 4: Calculate true airspeed

Goal: Calculate true airspeed when the user provides the indicated airspeed and mean sea level altitude
Actors: General user
Scenario: The user needs to determine his true airspeed knowing his indicated airspeed and mean sea level altitude

Test Case 4:

Input				**Output**		
Wind Speed	*Direction*	*True Airspeed*	*Course*	*Heading*	*Ground Speed*	*Correction Angle*
-10 knots	2 degrees	2 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
0 knots	2 degrees	-1 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
40 km/h	-2 degrees	2 km/h,	46 degrees	Error: Direction must be >1 and <=360 degrees	Error	Error
40 km/h	2 degrees	1 km/h	-46 degrees	Error: Course must be >=0 and <360 degrees	Error	Error
70 km/h	2 degrees	50 km/h	46 degrees	329 Degrees	39 km/h	103 degrees
40 knots	135 degrees	60 knots	30 degrees	70 degrees	56 km/h	40 degrees

Use Case 5: Calculate density altitude

Goal: Calculate density altitude when the user provides the pressure altitude and outside air temperature
Actors: General user
Scenario: The user needs to determine his density altitude knowing his pressure altitude and outside air temperature

Test Case 5:

Input				**Output**		
Wind Speed	*Direction*	*True Airspeed*	*Course*	*Heading*	*Ground Speed*	*Correction Angle*
-10 knots	2 degrees	2 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
0 knots	2 degrees	-1 knots,	46 degrees	Error: Speed must be >= 0	Error	Error
40 km/h	-2 degrees	2 km/h,	46 degrees	Error: Direction must be >1 and <=360 degrees	Error	Error
40 km/h	2 degrees	1 km/h	-46 degrees	Error: Course must be >=0 and <360 degrees	Error	Error
70 km/h	2 degrees	50 km/h	46 degrees	329 Degrees	39 km/h	103 degrees

40 knots	135 degrees	60 knots	30 degrees	70 degrees	56 km/h	40 degrees

Use Case 6: Calculate runway winds

Goal: Calculate runway winds when the user provides the runway direction, wind direction, and wind speed
Actors: General user
Scenario: The user needs to determine his runway winds knowing his runway direction, wind direction, and wind speed

Test Cases 6:

Input			**Output**
Runway direction	*Wind direction*	*Wind speed*	Runway winds
oas degrees	5 degrees	10 km/h	Error msg: Directions should be > 0 degrees and <360 degrees
-1 degrees	5 degrees	10 km/h	Error msg: Directions should be > 0 degrees and <360 degrees
0 degrees	-1 degrees	10 km/h	Error msg: Directions should be > 0 degrees and <360 degrees
361 degrees	5 km/h	10 km/h	Error msg: Directions should be > 0 degrees and <360 degrees
10 degrees	30 degrees	-1 km/h	Error msg: Speed must be >0 km/h
10 degrees	30 degrees	0 km/h	0 km/h headwind; 0 km/h crosswind
15 degrees	95 degrees	83 km/h	14.4 km/h headwind ; 81.7 km/h crosswind

Use Case 7: Calculate flying distance and course

Goal: Calculate flying distance and course between two airports when the user provides the IDs for both airports
Actors: General user
Scenario: The user needs to determine his flying distance and course between two airports knowing both airport IDs

Test Case 7:

Input	**Output**
Orlando; Jacksonville	Error msg: Input valid 3 letter Airport IDs
MCO ; JACKS	Error msg: Input valid 3 letter Airport IDs

345; JAX	Error msg: Input valid 3 letter Airport IDs
DAB ; MCO	Distance: 46.82 nautical miles; Course: 196.47 degrees
DAB; LAS	Distance: 3273 km; Course: 293.46 degrees

Use Case 8: Initialize airport ID text file

Goal: Load the airports inside the airport ID text file for use inside the app
Actors: Text file
Scenario: The app loads the airport ID text file for use in calculating the flying distance and course between two airports

Test Case 8:

Input	**Output**
DC , DAB	Error msg: Input valid 3 letter Airport IDs
BSSE, DAB	Error msg: Input valid 3 letter Airport IDs
KEN, MCO	Error msg: That airport ID is not in the database
DAB, MCO	Distance: 53.88 statute miles; Course: 196.47 degrees

Use Case 9: Modify airport ID text file

Goal: Modify the list of airport IDs available inside the app for use in calculating the flying distance and course
Actors: General user and text file
Scenario: The user needs to add an airport to the airport ID text file so that he can calculate the flying distance and course between two airports

Test Case 9:

Input (Airport, Long, Latitude)	**Output**
MCO, JAX , 5 radians	Error msg: Invalid longitude value. Positions must be >-3.142 radians and < 3.142 radians.
MCO, -45 radians, 0 radians	Error msg: Invalid latitude value. Positions must be >-3.142 radians and < 3.142 radians.
DC, 0 radians; 2.6 radians	Error msg: Input valid 3 letter Airport IDs
BSSE, 2.15 radians, 3.15 radians	Error msg: Input valid 3 letter Airport IDs
KEN; 0 radians, 2.54 radians	Airport KEN has been added to the database