F28SD – Coursework 1 – Lucca Anthony Marcondes Browning

Table of Contents:

T1 – Assumptions & Expectations:

Assumptions of the capabilities of the system:

1. In the instance that the RFS (Route Finder System) is not able to show any possible routes to the ATSA, the flight's departure will need to be delayed for **n** amount of time until the ATSA (Air Traffic Services Assistant) tries to use the FMS (Flight Management System), which in turn uses the RFS to find another possible route. It is assumed this could happen **m** number of times until a possible route is given to the ATSA by the FMS.
2. The flight plan should be archived to the FAS (Flight Archive System) and deleted from the FMS along with the flight strip so that the same flight plan cannot be used again.
3. The flight plan should be designated the status *active* when it is created, and *inactive* when the flight is completed along with the flight strip so that the same flight plan cannot be used again.
4. One can assume that the flight strip, which will be *inactive* after use and before deletion, cannot be reused for another flight during this time.
5. The pilot and the ASTA should not have access to each other's capabilities. For example, an ASTA should not be able to create a flight plan and a pilot should not be able to create a flight strip.
6. The Airports that any given Pilot wants to fly from/to should check the Pilot's list of certified airports to check if the Pilot should be allowed to access the runway.
7. The Pilots and the ATSAs should be able to see a list of incomplete flight plans/flight strips that they can continue working on after logging in.

Expectations about the environment the system will operate in:

1. It is specified that the Pilot inputs the flight plan into the FMS, and that the ATSA inputs the flight strip into the FMS; however, it is not specified which third party inputs the airport information into the FMS. It can be assumed that this third party has their own login PIN and can input the airport information into the FMS before logging out. This is a process that is very much like the Air Traffic Services Assistant's.
2. It should be standard protocol for the flight plan and flight strip not to be created too early as to stop a massive backlog of flights from completely overrunning the system and making it difficult for ATSA personnel to find exactly which flights to manage in their sessions.

T2 – Requirements:

Functional Requirements:

1. The FMS must authenticate the user (whether pilot, ATSA or other airport personnel) when they log in with their 6-digit pin.
2. It should be possible for both flight plans to be created by pilots and flight strips to be created by ATSAs.
3. The FMS should manage a collection of pilot and ATSA records.
4. The FMS should require all flight plan & flight strip information before allowing the pilot & ATSA to enter it.
5. The Pilot and ATSA should be able to review flight plan and flight strip information before confirming it.
6. It should require all airport information from the other airport personnel before allowing them to enter the information.
    a. It should also allow them to review the information before confirming it.
7. The system should present flight plan details and available routes to ATSAs during a session.
8. The system should use the RFS to find a list of available routes between current and destination airports.
9. The ATSA should be able to add a route to the flight plan and add it to the flight strip on the FMS.
10. The FMS should be able to send a list of inactive flight strips to the FAS at 11:59PM GMT, then delete them.

Non-Functional Requirements:

Usability

1. The FMS should be able to process a user request/input very quickly.
2. The system should have input validation.
3. The FMS should have a GUI so that non-technical savvy personnel can use it with ease.

Security

4. The system should have a function in place, such as two-factor authentication, when a device logs into the FMS for the first time so that no unwanted people have access to it.
5. The pilot should not have access to an ASTA's capabilities, and vice verse.
6. The FMS should have a firewall to protect what is a very important system from malicious people from attacking it.

Reliability

7. The FMS should have a GUI so that non-technical savvy personnel can use it with ease.
8. The system should have a quick response time when creating flight plans & flight strips.

Performance

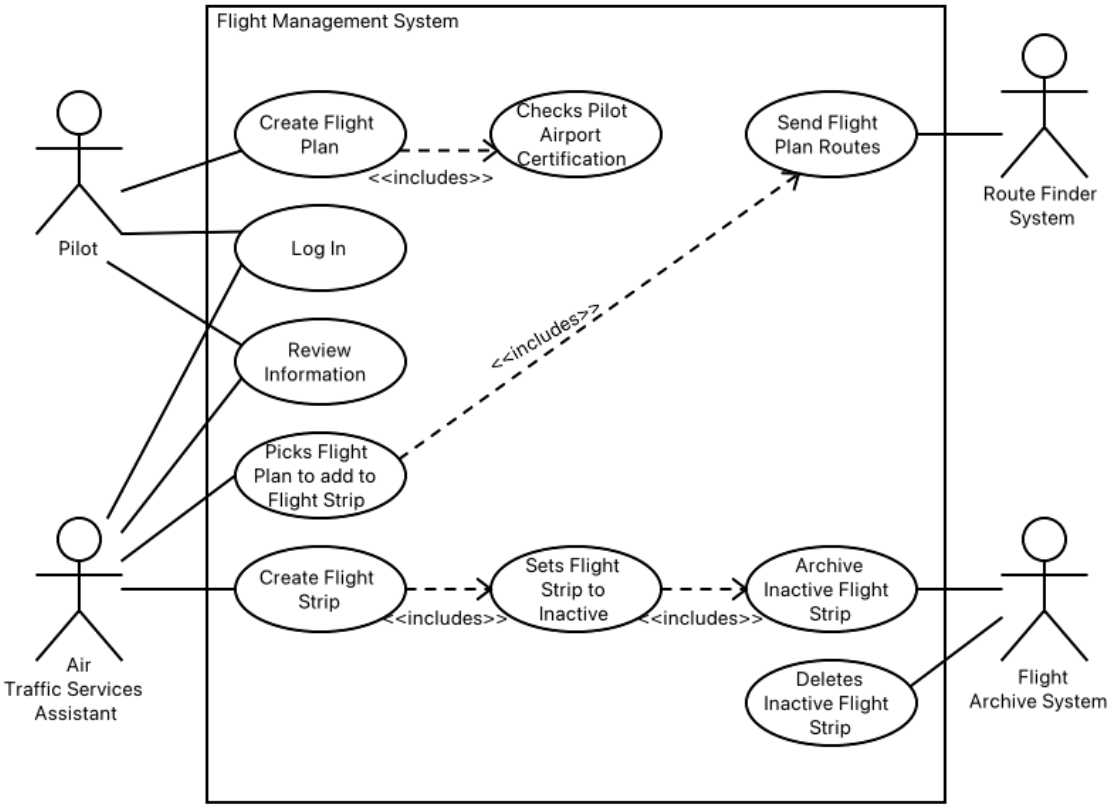
9. The system should have a quick response time when creating flight plans & flight strips.

10. It should have a data management system to store and retrieve information to and from accurately.
11. The FMS should be able to handle multiple flight plans and flight strips efficiently and with no delays.

Availability

12. The FMS should be able to have multiple people logged in at once so that pilots, ATSAs, and other airport personnel can be logged in at the same time.
13. The system must be created in a way that respects international law, or must have multiple branches that pilots and ASTAs from foreign countries can use.
14. The FMS should have a GUI so that non-technical savvy personnel can use it with ease.

T3A – Use Case Model:



T3B – Use Case Description:

Use Case: createFlightPlan
ID: 1
Goal: Create a flight plan that the ATSA can use to create a flight strip.
Primary Actor: Pilot
Secondary Actor: None
Preconditions: 1. Pilot has a valid six-digit PIN. 2. The pilot has access to a device with access to the FMS.
Postconditions: 1. The flight plan is created. 2. The flight plan an be accessed by the ATSA.
Main Flow: 1. Include(loginToFMS) 2. FMS shows list of Flight Plans that are incomplete from a previous session and an option to create a new Flight plan. 3. Pilot picks an option and provides the following information to the FMS: a. FPID (flight plan identifier) b. PID (pilot identifier) c. Departure airport (IATA code) d. Destination airport (IATA code) e. Expected Departure Time (EDT) 4. Pilot reviews the Flight Plan before completing it. 5. FMS successfully creates a flight plan and associates it with the pilot's record in the collection of pilot records. 6. Include(reviewAndLogout)
Alternative Flow: 3a. One of the pieces of information is invalid. 1. FMS requests the Pilot that the information is inputted again. 2. Returns to Step 2 Main Flow. 4a. Flight Plan is incorrect. 1. Pilot requests the FMS the ability to input the information again. 2. Return to Step 3 Main Flow. 6a. Pilot wants to keep working on making Flight Plans. 1. Pilot requests the FMS to be returned to the list of incomplete Flight Plans with the option to create a new Flight plan. 2. Returns to Step 2 Main Flow.

Use Case: createFlightStrip

ID: 2

Goal: Create a flight strip that can be used to organize plane departures.

Primary Actor: The ATSA

Secondary Actor: The Pilot

Preconditions:

1. ATSA has a valid six-digit PIN.
2. The ATSA has access to a device with access to the FMS.

Postconditions:

1. The flight strip is created.
2. The flight strip can be used by the ATSA to (see when the planes should leave).

Main Flow:

1. Include(loginToFMS)
2. FMS presents a list of incomplete Flight Strips as well as an option to create a new one.
3. Pilot picks either option.
4. FMS presents the available flight plans for processing.
5. ATSA selects a flight plan (created by a pilot) to process.
6. FMS displays the flight plan details.
7. FMS uses the Route Finder System (RFS) to find a list of available routes between the departure and destination airports and displays them.
8. ATSA decides which of the available routes to allocate to the flight and adds it to the flight strip.

Steps 3-6 must be repeated until all relevant flights have been added.

9. FMS creates a flight strip and associates it with the flight plan(s)
10. Include(reviewAndLogout)

Alternative Flow:

5a. There are no flights to add. There are flights in the Flight Strip.

1. Skip to Step 9 Main Flow

5b. There are no flights to add. There are no flights in the Flight Strip.

1. Skip to Step 10 Main Flow if there are not flights in the flight strip.

7a. There are no available routes between the departure and destination airports.

1. The ATSA shelves that flight plan temporarily and adds it to another flight strip later
2. Returns to Step 4 Main flow.

10a. ATSA wants to continue working on making Flight Strips. There are still Flight Plans.

1. Returns to Step 2 Main flow.

Extension Use Case: loginToFMS

ID: 3

Goal: The actor should be logged into the FMS.

Primary Actor: The Pilot or the ATSA or another relevant airport personnel.
Secondary Actor: None
Segment Preconditions: 1. The actor has a valid six-digit PIN 2. The actor has access to a device with access to the FMS
Segment Postconditions: 3. The actor is logged into the FMS
Segment Flow: 1. Actor inputs their 6-digit pin into the FMS. 2. FMS logs the actor in Successfully.
Alternative Segment Flow: None

Extension Use Case: reviewAndLogout
ID: 4
Goal: The information should be correct and the actor should be logged out.
Primary Actor: The Pilot or the ATSA or another relevant airport personnel.
Secondary Actor: None
Segment Preconditions: 1. The actor has a valid six-digit PIN 2. The actor has access to a device with access to the FMS
Segment Postconditions: 1. The flight strip/plan is correct. 2. The actor is logged out
Segment Flow: 1. FMS displays the flight strip/plan details to the actor 2. Actor reviews the flight strip/plan details and confirms 3. Actor logs out of the FMS
Alternative Segment Flow: 2a. One of the pieces of information is invalid. 1. Actor reinputs the information. 2. Returns to Step 1 Segment flow.

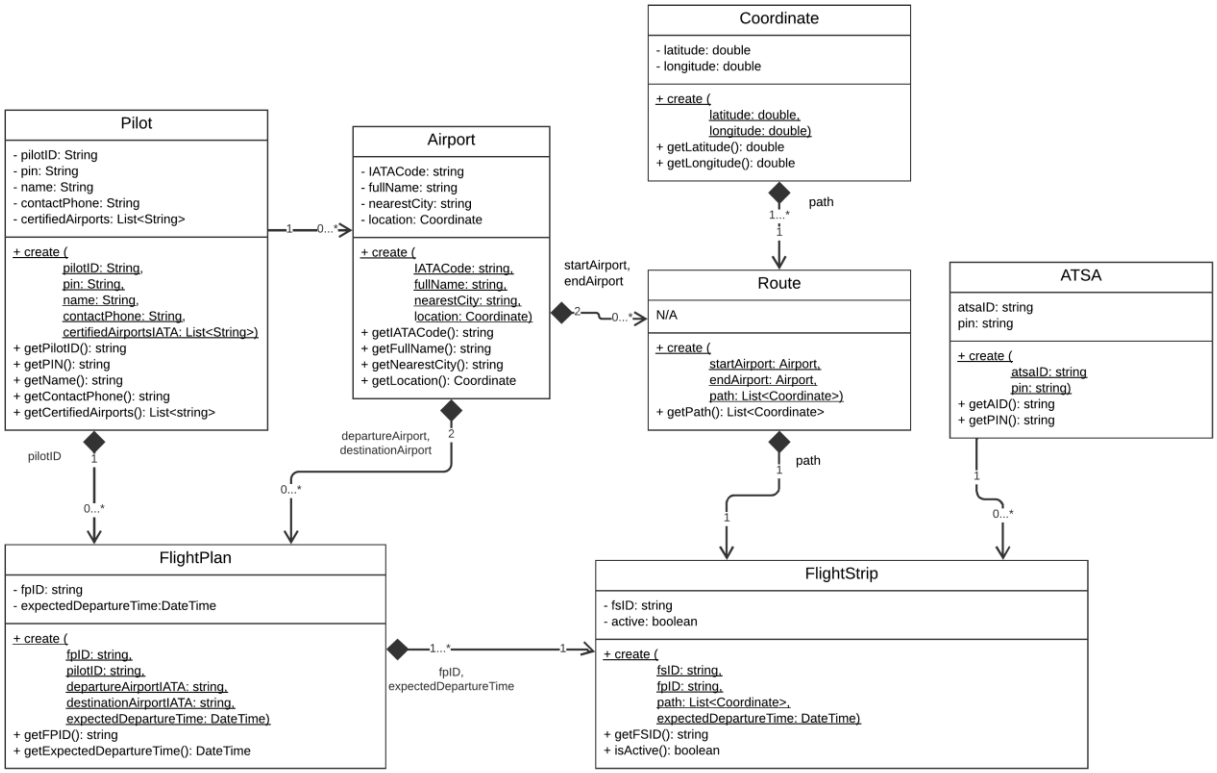
Use Case: archiveFlightStrip
ID: 5
Goal: The Flight Strip should be archived and deleted from the FMS
Primary Actor: The FMS
Secondary Actor: None
Preconditions: 1. It is 11:59PM GMT. 2. The flight strip is not active.
Postconditions:

1. The flight strip is archived. 2. The flight strip has been deleted from the FMS.
Main Flow: 1. The FMS reviews the flight strip 2. It archives the flight strip to the FAS (Flight Archive System) 3. It deletes the flight strip 4. The FMS moves onto the next flight strip Steps 1-4 repeat as long as there are flight strips that it has not reviewed.
Alternative Flow: 2a. The flight is still active. 1. The FAS skips to step 4.

T4 – Traceability Matrix:

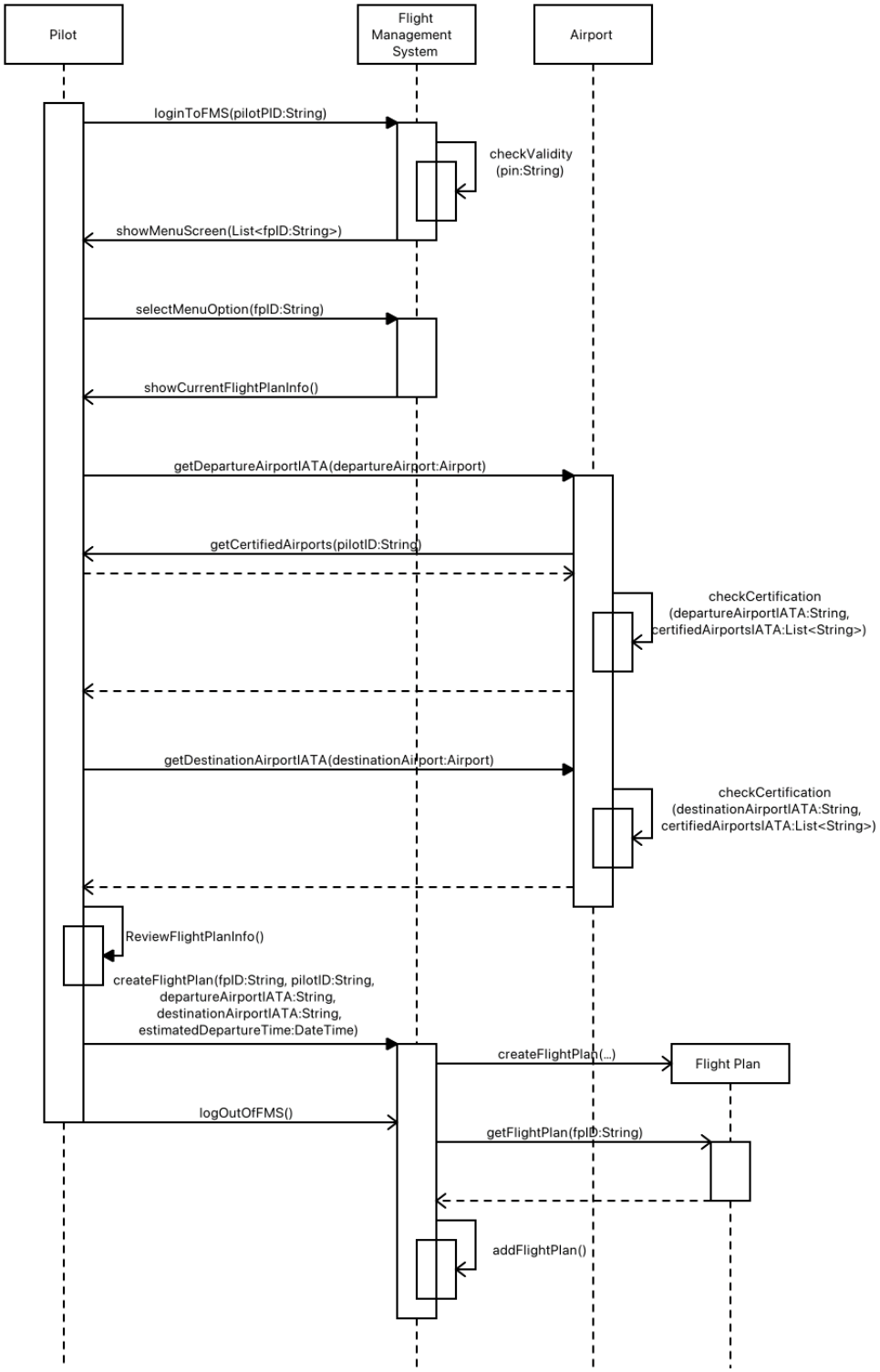
	Use Cases					
Functional Requirements		UC 1	UC 2	UC 3	UC 4	UC 5
	FR1			X		
	FR2	X	X			
	FR3	X	X			
	FR4	X	X			
	FR5				X	
	FR6			X	X	
	FR7		X			
	FR8		X			
	FR9		X			
	FR10					X

T5 – Class Diagram:

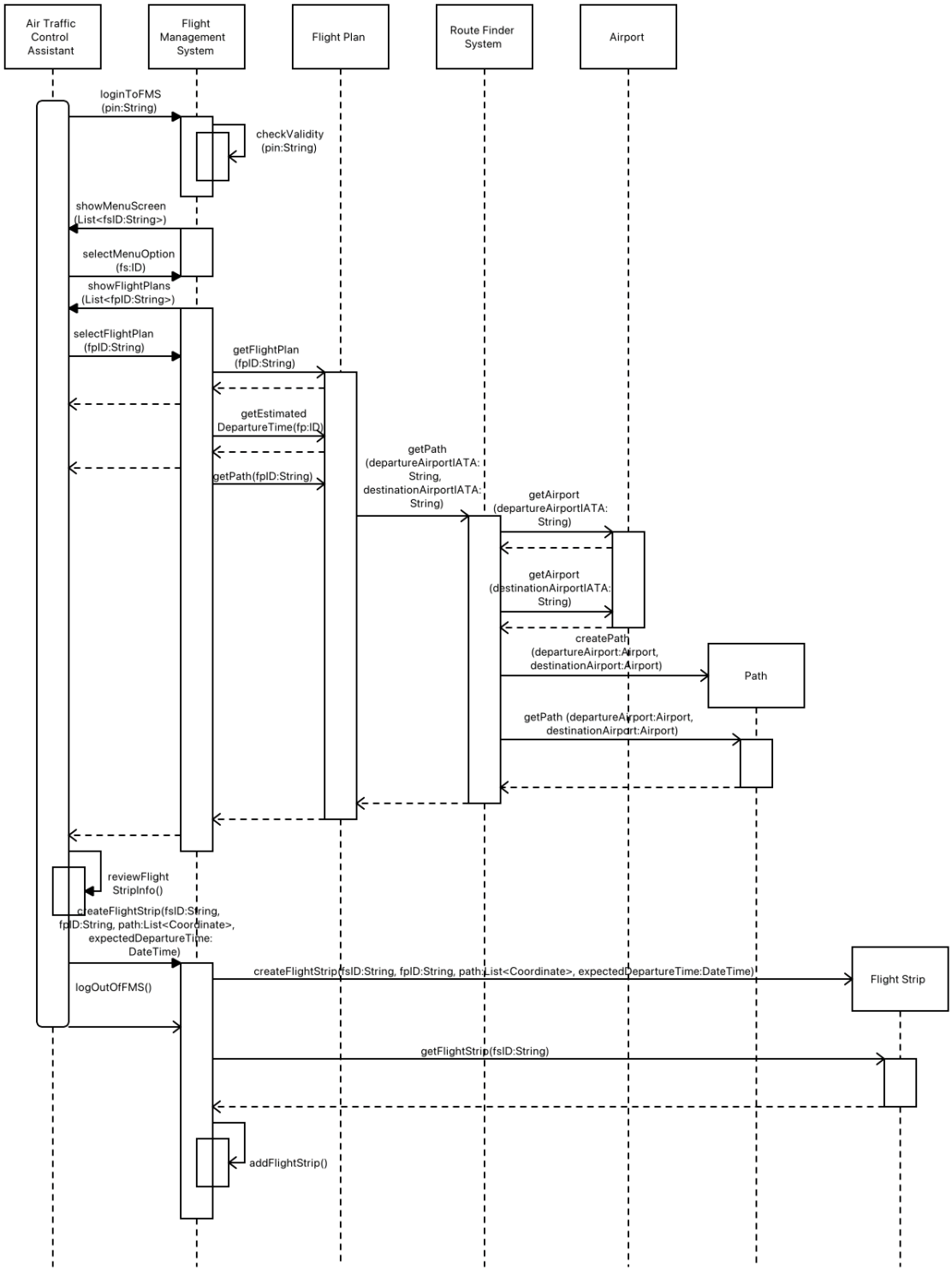


T6 – Sequence Diagrams:

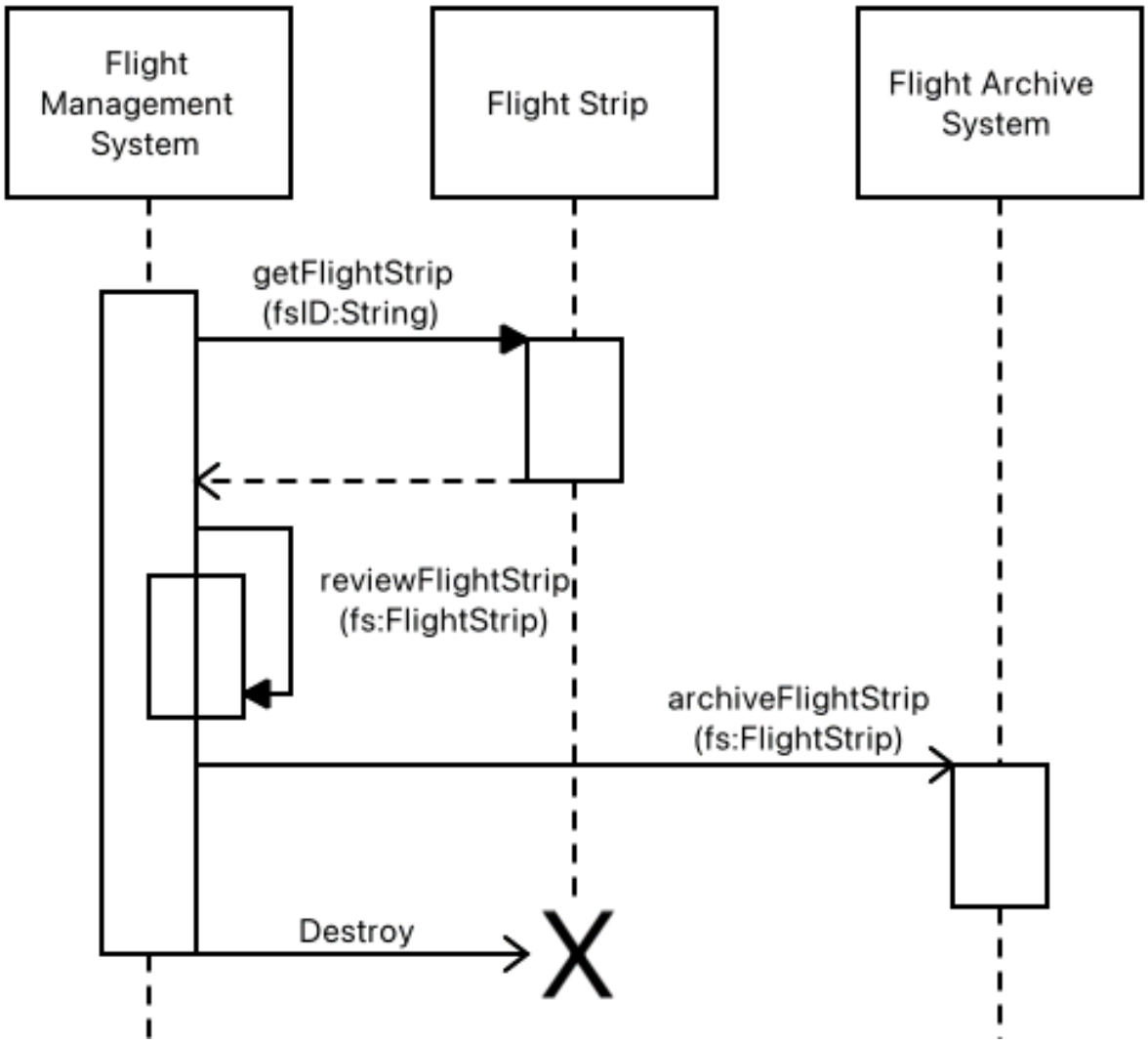
createFlightPlan Sequence Diagram:



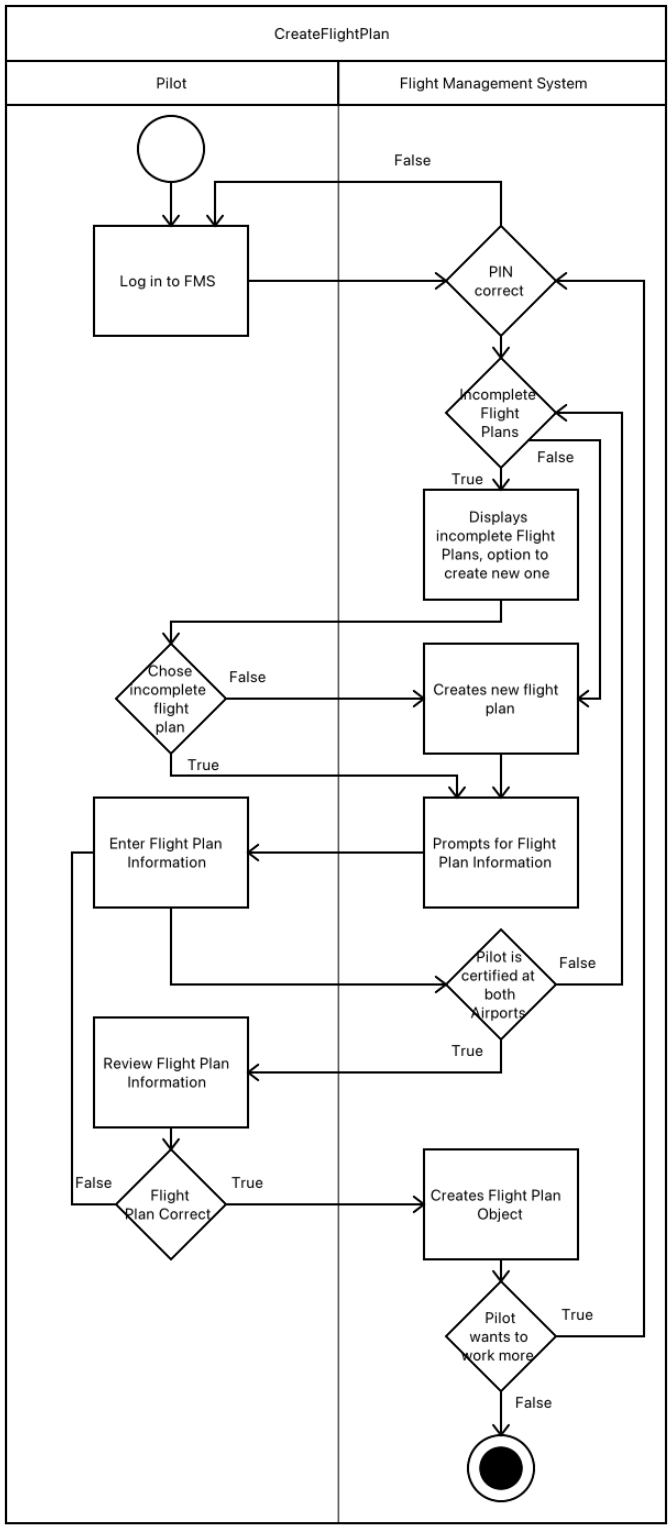
createFlightStrip Sequence Diagram:

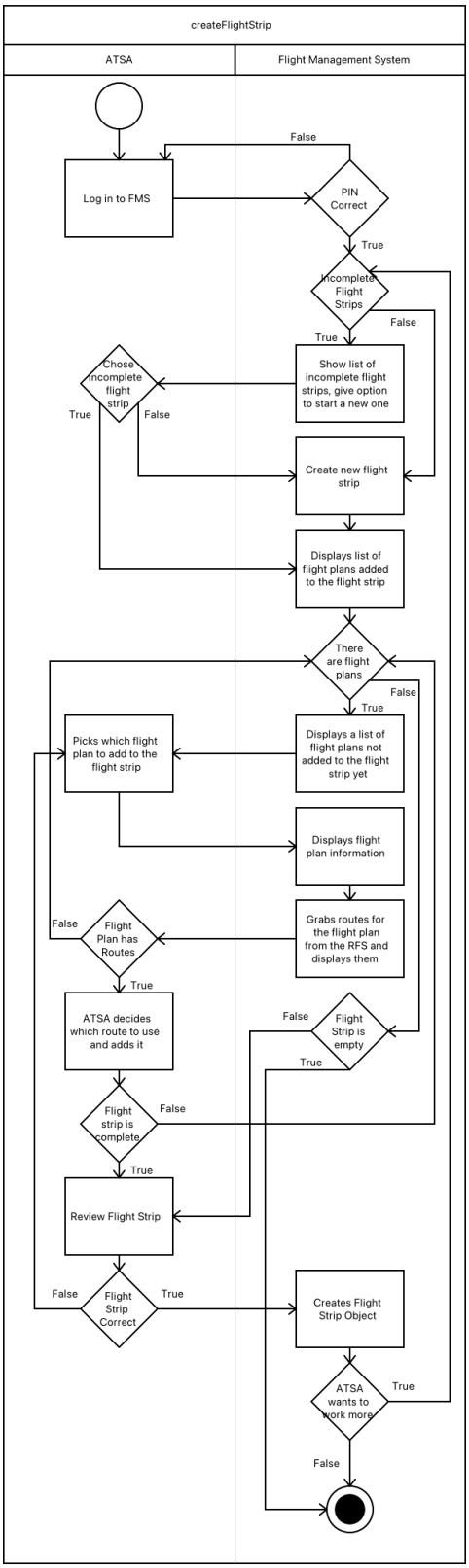


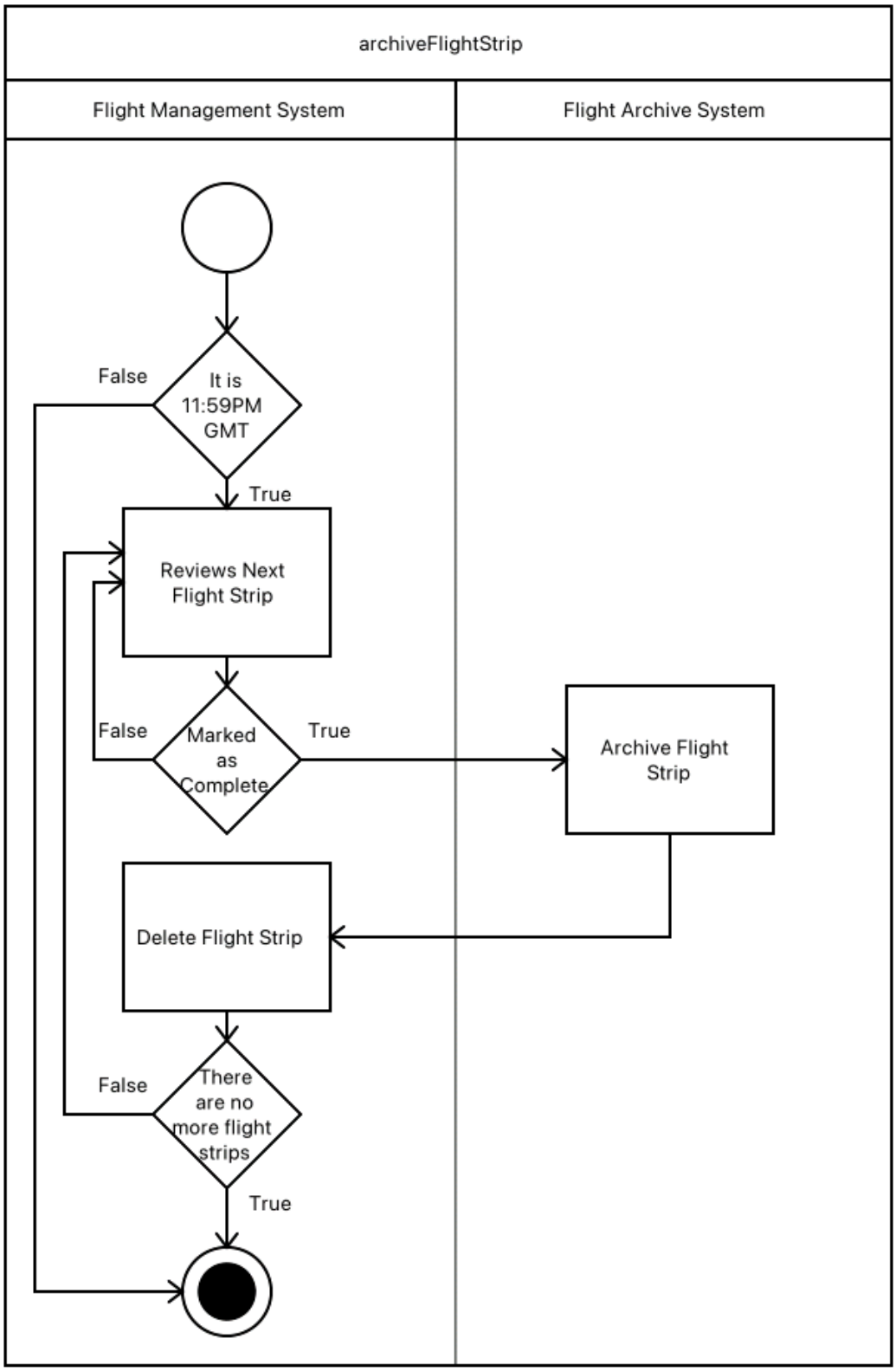
archiveFlightStrip Sequence Diagram:



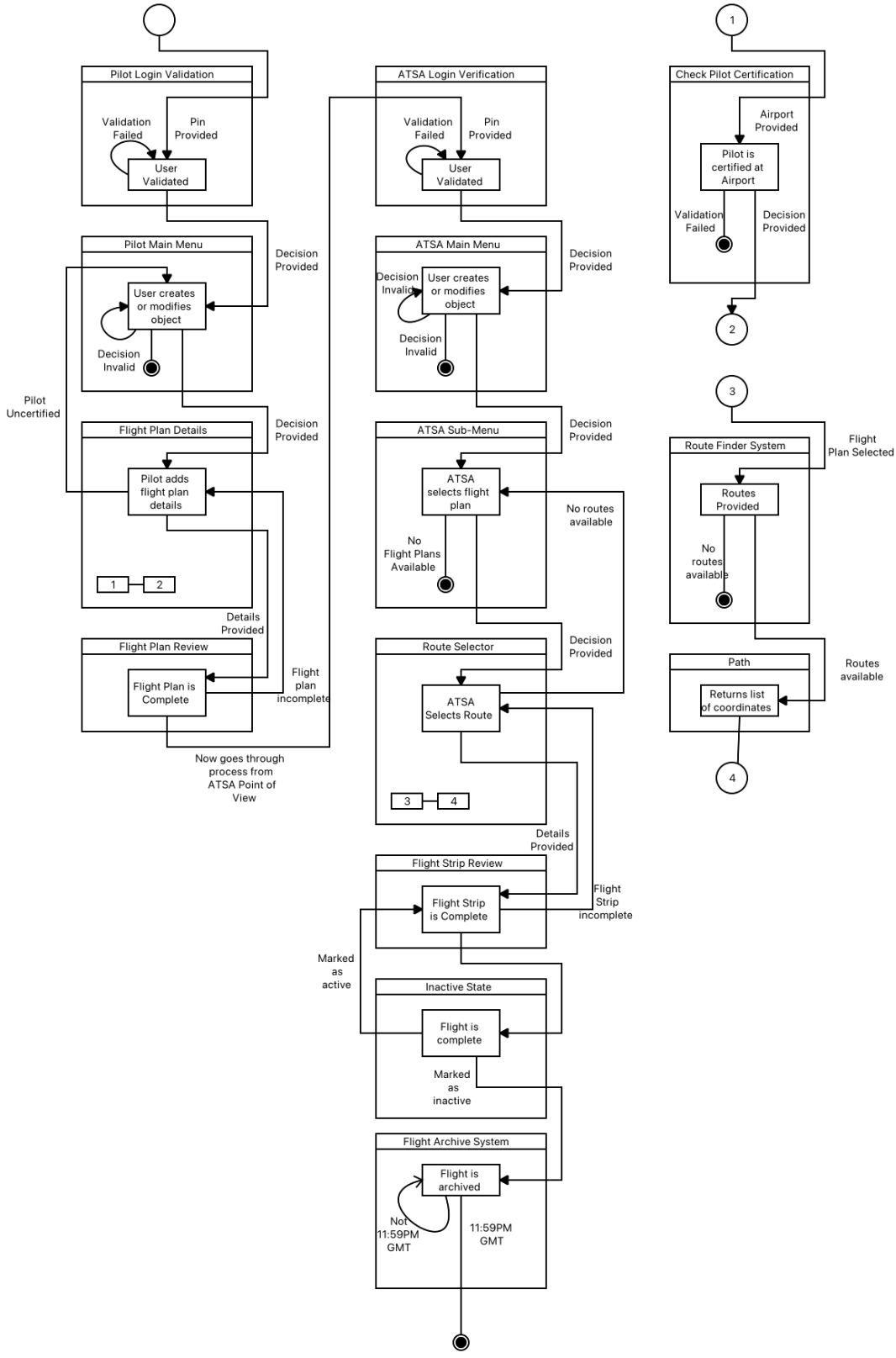
T7 – Activity Diagrams:




createFlightStrip
ATSA
Flight Management System
Log in to FMS
False
PIN Correct
True
Incomplete Flight Strips
False
True
Show list of incomplete flight strips, give option to start a new one
Chose incomplete flight strip
True
False
Create new flight strip
Displays list of flight plans added to the flight strip
There are flight plans
False
True
Displays a list of flight plans not added to the flight strip yet
Picks which flight plan to add to the flight strip
Displays flight plan information
Grabs routes for the flight plan from the RFS and displays them
False
Flight Plan has Routes
True
ATSA decides which route to use and adds it
False
Flight Strip is empty
True
Flight strip is complete
False
True
Review Flight Strip
False
Flight Strip Correct
True
Creates Flight Strip Object
ATSA wants to work more
True
False


archiveFlightStrip
Flight Management System
Flight Archive System
It is 11:59PM GMT
False
True
Reviews Next Flight Strip
Marked as Complete
False
True
Archive Flight Strip
Delete Flight Strip
There are no more flight strips
False
True

T8 – State Machine Diagram:



T9 – Scenario Test Cases (Using Activity Diagrams):

createFlightPlan Test Cases:

Path	Comment	Path Condition
1	Successful login. Successful Flight Plan creation.	1. Log in to FMS (Correct) 2. There are incomplete Flight Plans (Exists/Doesn't) 3. Prompts for Flight Plan Information 4. Enter Flight Plan Information 5. Review Flight Plan Information (Correct) 6. Pilot is done working (True)
2	Unsuccessful login (i number of times), then successful login. Successful Flight Plan creation.	1. Log in to FMS (Incorrect) (i times) 2. Log in to FMS (Correct) 3. There are incomplete Flight Plans (Exists/Doesn't) 4. Prompts for Flight Plan Information 5. Enter Flight Plan Information 6. Review Flight Plan Information (Correct) 7. Pilot is done working (True)
3	Successful login. There are incomplete Flight Plans (Chooses old Flight Plan to Edit). Successful Flight Plan creation.	1. Log in to FMS (Correct) 2. There are incomplete Flight Plans (Exists) 3. Chooses old Flight Plan to edit 4. Prompts for Flight Plan Information 5. Enter Flight Plan Information 6. Review Flight Plan Information (Correct) 7. Pilot is done working (True)
4	Successful login. There are incomplete Flight Plans (Creates new Fight Plan). Successful Flight Plan creation.	1. Log in to FMS (Correct) 2. There are incomplete Flight Plans (Exists) 3. Creates new Flight Plan 4. Prompts for Flight Plan Information 5. Enter Flight Plan Information 6. Review Flight Plan Information (Correct) 7. Pilot is done working (True)
5	Successful login. There are no incomplete Flight Plans (Creates new Fight Plan). Successful Flight Plan creation.	1. Log in to FMS (Correct) 2. There are incomplete Flight Plans (Does not exist) 3. Creates new Flight Plan 4. Prompts for Flight Plan Information 5. Enter Flight Plan Information 6. Review Flight Plan Information (Correct) 7. Pilot is done working (True)
6	Successful login.	1. Log in to FMS (Correct)

	Unsuccessful Flight Plan Creation (n number of times), then Successful Flight Plan creation.	2. There are incomplete Flight Plans (Exists/Doesn't) 3. Prompts for Flight Plan Information 4. Enter Flight Plan Information 5. Review Flight Plan Information (Incorrect) (n times) 6. Review Flight Plan Information (Correct) 7. Pilot is done working (True)
7	Successful login. Successful Flight Plan creation. Pilot wants to create more flight plans.	1. Log in to FMS (Correct) 2. There are incomplete Flight Plans (Exists/Doesn't) 3. Prompts for Flight Plan Information 4. Enter Flight Plan Information 5. Review Flight Plan Information (Correct) 6. Pilot is done working (False) 7. Repeat steps 2-6 until the pilot is done working.

createFlightStrip Test Cases:

Path	Comment	Path Condition
1	Successful login. There are flight plans. Flight plan has Routes. Flight Strip is Complete. Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in paths 7-9, 11-12 4. Displays List of flight plans not added to any flight strips (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. Grabs routes for the flight plan from the RFS and displays them (Has routes) 8. ATSA decides which route to use for the flight plan (Flight Strip is complete) 9. Review Flight Strip Information (Correct)
2	Unsuccessful login (m number of times), then then successful login. There are flight plans. Flight Plan has Routes. Flight Strip is Complete. Review is successful.	1. Log in to FMS (Incorrect) (m times) 2. Log in to FMS (Correct) 3. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in Paths 4-6 4. Displays current list of flight plans added to the flight strip. (Exists/Doesn't)

		• Explored in Paths 7-9, 11-12 5. Displays List of flight plans not added to any flight strips (Exists) 6. Picks which flight plan to add to the flight strip 7. Displays Flight Plan Information 8. Grabs routes for the flight plan from the RFS and displays them (Has routes) 9. ATSA decides which route to use for the flight plan (Flight Strip is complete) 10. Review Flight Strip Information (Correct)
3	Unsuccessful login (m number of times).	1. Log in to FMS (Incorrect) (m times)
4	Successful login. There are uncomplete flight strips. Works on an incomplete flight strip. There are flight plans. Flight plan has Routes. Flight Strip is Complete. Review is successful. ATSA wants to create another flight strip.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists) 3. Works on incomplete flight strip 4. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in Paths 7-9, 11-12 5. Displays List of flight plans not added to any flight strips (Exists) 6. Picks which flight plan to add to the flight strip 7. Displays Flight Plan Information 8. Grabs routes for the flight plan from the RFS and displays them (Has routes) 9. ATSA decides which route to use for the flight plan (Flight Strip is complete) 10. Review Flight Strip Information (Correct) 11. Repeat Steps 2-10 until all flight strips are complete
5	Successful login. There are incomplete flight strips. Creates new flight strip. There are flight plans. Flight plan has Routes. Flight Strip is Complete. Review is successful. ATSA wants to create another flight strip.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists) 3. Creates new flight strip 4. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in Paths 7-9, 11-12 5. Displays List of flight plans not added to any flight strips (Exists) 6. Picks which flight plan to add to the flight strip

		7. Displays Flight Plan Information 8. Grabs routes for the flight plan from the RFS and displays them (Has routes) 9. ATSA decides which route to use for the flight plan (Flight Strip is complete) 10. Review Flight Strip Information (Correct) 11. Repeat Steps 2-10 until all flight strips are complete.
6	Successful login. There are no incomplete flight strips. Creates new flight strip. There are flight plans. Flight plan has Routes. Flight Strip is Complete. Review is successful. ATSA wants to create another flight strip.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Does not exist) 3. Creates new flight strip 4. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in Paths 7-9, 11-12 5. Displays List of flight plans not added to any flight strips (Exists) 6. Picks which flight plan to add to the flight strip 7. Displays Flight Plan Information 8. Grabs routes for the flight plan from the RFS and displays them (Has routes) 9. ATSA decides which route to use for the flight plan (Flight Strip is complete) 10. Review Flight Strip Information (Correct) 11. Repeat Steps 2-10 until all flight strips are complete.
7	Successful login. There have been flight plans previously added to the flight strip. There are no flight plans. Flight Strip is Complete. Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists) 4. Displays List of flight plans not added to any flight strips (Does not exist) 5. Review Flight Strip Information (Correct)
8	Successful login. There have been no flight plans previously added to the flight strip. There are no flight plans.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6

		3. Displays current list of flight plans added to the flight strip. (Does not exist) 4. Displays List of flight plans (Does not exist)
9	Successful login. There have been flight plans previously added to the flight strip. There are flight plans. Flight Plan has no routes. Flight Strip is Complete. Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists) 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. RFS returns null (Has no routes) (Flight Strip is Complete) 8. Review Flight Strip Information (Correct)
10	Successful login. There are flight plans. Flight Plan has no routes. Flight Strip is incomplete (repeats previous steps). Flight strip gets complete. Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in paths 7-9, 11-12 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. RFS returns null (Has no routes) (Flight Strip is incomplete) 8. Repeat 3-6 (until flight strip gets complete) 9. Review Flight Strip Information (Correct)
11	Successful login. There have been flight plans previously added to the flight strip. There are flight plans. Flight Plan has no routes. Flight Strip is incomplete (repeats previous steps). Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists) 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. RFS returns null (Has no routes) (Flight Strip is incomplete)

		8. Repeat 3-6 (until no more flight plans) 9. Review Flight Strip Information (Correct)
12	Successful login. There have been no flight plans previously added to the flight strip. There are flight plans. Flight Plan has no routes. Flight Strip is incomplete (repeats previous steps). Flight strip never gets completed.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Does not exist) 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. RFS returns null (Has no routes) (Flight Strip is incomplete) 8. Repeat 3-6 (until no more flight plans)
13	Successful login. There are flight plans. Flight plan has Routes. Flight Strip is incomplete (repeats previous steps). Flight strip gets complete. Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in paths 7-9, 11-12 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip 6. Displays Flight Plan Information 7. Grabs routes for the flight plan from the RFS and displays them (Has routes) 8. ATSA decides which route to use for the flight plan (Flight Strip is incomplete) 9. Repeat 3-6 (until flight strip is complete/ until no more flight plans) 10. Review Flight Strip Information (Correct)
14	Successful login. There are flight plans. Flight plan has Routes. Flight Strip is incomplete (repeats previous steps). Flight strip gets complete. Review is unsuccessful (repeats previous steps). Review is successful.	1. Log in to FMS (Correct) 2. Displays list of Flight Strips that are incomplete. (Exists/Doesn't) • Explored in paths 4-6 3. Displays current list of flight plans added to the flight strip. (Exists/Doesn't) • Explored in paths 7-9, 11-12 4. Displays List of flight plans (Exists) 5. Picks which flight plan to add to the flight strip

		6. Displays Flight Plan Information 7. Grabs routes for the flight plan from the RFS and displays them (Has routes) 8. ATSA decides which route to use for the flight plan (Flight Strip is incomplete) 9. Repeat 3-6 (until flight strip is complete/ until no more flight plans) 10. Review Flight Strip Information (Incorrect) 11. Repeats 2-7, 9 (until flight strip information is correct).

archiveFlightStrip Test Cases:

Path	Comment	Path Condition
1	It is 11:59PM GMT. There is a flight strip to review. It is marked as Inactive. There are no other flight strips to review.	1. Checks time (Is 11:59PM GMT) 2. Reviews next Flight Strip (Exists) 3. Checks whether Flight Strip is marked as Inactive (True) 4. Flight Strip is Deleted
2	It not 11:59PM GMT.	1. Checks time (Is not 11:59PM GMT)
3	It is 11:59PM GMT. There is no flight strip to review.	1. Checks time (Is 11:59PM GMT) 2. Reviews next Flight Strip (Does not exist)
4	It is 11:59PM GMT. There is a flight strip to review. It is marked as Active.	1. Checks time (Is 11:59PM GMT) 2. Reviews next Flight Strip (Exists) 3. Checks whether Flight Strip is marked as Inactive (False)
5	It is 11:59PM GMT. There is a flight strip to review. It is marked as Inactive. There other flight strips to review.	1. Checks time (Is 11:59PM GMT) 2. Reviews next Flight Strip (Exists) 3. Checks whether Flight Strip is marked as Inactive (True) 4. Flight Strip is Deleted 5. Repeats 1-4 until is no longer 11:59PM GMT
6	It is 11:59PM GMT. There is a flight strip to review. It is marked as Inactive. There other flight strips to review.	1. Checks time (Is 11:59PM GMT) 2. Reviews next Flight Strip (Exists) 3. Checks whether Flight Strip is marked as Inactive (True) 4. Flight Strip is Deleted 5. Repeats 1-4 until there are no more flight strips to review