

Software Test Plan

ACAFAX - Flight Equipment Failure Agent

Team Members

Dylan Ostolaza dostolaza2024@my.fit.edu

Zachary Reese zreese2023@my.fit.edu

Avery Mackey amackey2023@my.fit.edu

Brianna Marshall bmarshall2022@my.fit.edu

Client & Faculty Advisor

Dr. Siddhartha Bhattacharyya sbhattacharyya@fit.edu

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1. Introduction

This document outlines the testing plan for the Autonomous Cognitive Agent. Each of the core functions has been divided into test cases with procedures and expected outputs. The test plan ensures that the system meets functional, usability, and performance requirements by simulating real flight scenarios, from the initial flight plan through failure detection, response, and route modification.

1.1 Core Functions

- Core Function 1: Initial Flight Plan
- Core Function 2: Equipment Failure Initiation
- Core Function 3: Equipment Failure Agent Detection
- Core Function 4: Equipment Failure Agent Response
- Core Function 5: Flight Route Modification

2. Core Function 1: Initial Flight Plan

2.1 Purpose

Allow the system to generate, validate, and store an initial flight plan from the mission inputs before the flight begins.

2.2 Test Case 1: Creating an Initial Flight Plan

2.2.1 Procedure

1. User navigates to the "Flight Plan" screen
2. User enters the origin, destination, and any required waypoints
3. User enters aircraft parametersUser submits the plan and the system generates the route

2.2.2 Expected Output

The system generates a complete route and displays the waypoints, estimated time of arrival, and estimated fuel usage.

2.3 Test Case 2: Validating the Flight Plan Against Constraints

2.3.1 Procedure

1. User opens a generated flight plan
2. System checks the route against altitude limits, fuel range, and restricted areas

2.3.2 Expected Output

The system reports that the plan passes all constraint checks.

3. Core Function 2: Equipment Failure Initiation

3.1 Purpose

Allow a failure to be triggered on a specific piece of equipment, either manually or on a scheduled scenario, so that the failure handling can be tested.

3.2 Test Case 1: Initiating a Single Equipment Failure

3.2.1 Procedure

1. User navigates to the "Failure Injection" screen
2. User selects an equipment component
3. User selects the failure type and severity
4. User confirms to initiate the failure

3.2.2 Expected Output

The selected equipment enters a failed state and the change is reflected in the flight state.

3.3 Test Case 2: Initiating a Scheduled or Multiple Failure

3.3.1 Procedure

1. User selects two or more components, or sets a trigger time for a failure
2. User confirms the scenario
3. Flight progresses until the trigger condition is met

3.3.2 Expected Output

The failures are initiated at the configured time or condition.

4. Core Function 3: Equipment Failure Agent Detection

4.1 Purpose

Enable the agent to monitor equipment and flight data and to detect when a failure has occurred.

4.2 Test Case 1: Detecting an Initiated Failure

4.2.1 Procedure

1. A failure is initiated on a component

2. Agent monitors telemetry and equipment status

4.2.2 Expected Output

The agent identifies the failed component and failure type.

4.3 Test Case 2: Distinguishing Failures from Normal Variation

4.3.1 Procedure

1. Flight is in progress with no real failure
2. A brief sensor fluctuation or noisy reading occurs

4.3.2 Expected Output

The agent does not report a failure for normal variation.

5. Core Function 4: Equipment Failure Agent Response

5.1 Purpose

Enable the agent to select and carry out an appropriate response once a failure has been detected.

5.2 Test Case 1: Selecting and Executing a Response Action

5.2.1 Procedure

1. Agent detects a failure
2. Agent evaluates the available response options
3. Agent selects and executes a response

5.2.2 Expected Output

The agent performs a response that suits the failure and reports the action taken.

5.3 Test Case 2: Responding to Multiple or Worsening Failures

5.3.1 Procedure

1. A second failure occurs, or the first failure worsens
2. Agent re-evaluates the situation

5.3.2 Expected Output

The agent updates its response based on the new state.

6. Core Function 5: Flight Route Modification

6.1 Purpose

Allow the flight route to be changed after a failure so the flight can continue safely or end at a suitable location.

6.2 Test Case 1: Modifying the Route After a Failure

6.2.1 Procedure

1. Agent completes its response to a detected failure
2. System calculates a modified route
3. System applies the new route

6.2.2 Expected Output

A new route is generated and displayed in place of the original flight plan.

6.3 Test Case 2: Validating and Confirming the Modified Route

6.3.1 Procedure

1. System presents the modified route
2. System checks the route against fuel, terrain, and environmental conditions

6.3.2 Expected Output

The modified route is validated and the flight plan is updated.