Test Report (Student #3)



**Group Number:** C3.040  
**Repository:** <https://github.com/DP2-C1-037/Acme-ANS-C3>

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# Executive Summary

This testing report presents the results of both functional and performance testing conducted on the system developed in the Acme-ANS-C3 project. It includes a compilation of the test cases implemented, grouped by feature, their effectiveness in detecting bugs, and the performance metrics obtained through testing on two different computers.

The goal of this analysis is to evaluate the system’s stability, reliability, and efficiency under different execution environments.

# Revision Table

|  |  |  |
| --- | --- | --- |
| **Revision Number** | **Date** | **Description** |
| 1.0 | 15/09/2025 | Functional testing |
| 1.1 | 26/05/2025 | Performance testing |
| 2.0 | 19/09/2025 | Added missing Test Cases |
| 2.1 | 09/10/2025 | Performance testing updated |

# Introduction

This document outlines the testing process carried out to assess both the functional and non-functional aspects of the system. The primary objective is to verify that the system adheres to the client’s specified requirements and behaves reliably and efficiently across different execution environments.

Functional testing focuses on ensuring that each implemented feature performs as expected and detects any deviation from the intended behaviour.

Performance testing, on the other hand, evaluates the responsiveness and stability of the system under varying workloads and hardware configurations.

The structure of this document is as follows:

* Section 4 presents the functional test cases, organized by feature. Each test case includes a brief description, the observed outcome, and an assessment of how effective it was at uncovering defects.

Also, it analyses the system’s performance by including execution time measurements, relevant statistical charts, 95% confidence intervals for the wall time, and hypothesis testing to compare performance across different machines.

* Section 5 provides a comprehensive summary of the testing results and highlights the most important findings and conclusions drawn from the process.
* Section 6 lists the references and resources used, if applicable.

# Contents

## Functional Testing

Abbreviations used in this section:

* Member: *flight crew member.*
* Assignment: *flight assignment.*

When accessing lists, make sure that the correct information is displayed. This includes *Last Update Moment, Status, Duty* for assignments, *Flight Number, Incident Type, and Severity Level* for activity logs.

Additionally, for publish, update, and create actions, it is necessary to test each attribute shown on the form by iterating through all the possibilities explained in class, while leaving the other attributes empty.

Finally, remember that read-only attributes must also be tested.

### 4.1.1 Flight Assignment

#### Flight Assignment: ListCompleted

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-01 | Access the list of *completed flight assignments* being logged in as a member | The system shows only completed and published assignments | Low |
| TC-02 | Access the list with a different role | Access is denied | Low |
| TC-03 | Access the list while unauthenticated | Access is denied | Low |

#### Flight Assignment: ListMyCompleted

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-04 | Access the list of *my* *completed flight assignments* while logged in as a member | The system shows only the completed assignments (published and not published) linked to the current user | Low |
| TC-05 | There are no completed assignments for the current member | The system returns an empty list without error | Low |
| TC-06 | Access the list with a different role | Access is denied | Low |
| TC-07 | Access the list while unauthenticated | Access is denied | Low |

#### Flight Assignment: ListPlanned

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-08 | Access the list *planned flight assignments* while logged in as a member | The system shows only future and published assignments | Low |
| TC-09 | There are no planned and published assignments | The system returns an empty list without error | Low |
| TC-10 | Access the list with a different role | Access is denied | Low |
| TC-11 | Access the list while unauthenticated | Access is denied | Low |

#### Flight Assignment: ListMyPlanned

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-12 | Access the list *my* *planned flight assignments* while logged in as a member | The system shows only my future assignments | Low |
| TC-13 | There are no planned assignments for the current member | The system returns an empty list without error | Low |
| TC-14 | Access the list with a different role | Access is denied | Low |
| TC-15 | Access the list while unauthenticated | Access is denied | Low |

#### Flight Assignment: Show

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-16 | Access a published planned assignment as the owner member | The system shows the assignment correctly | High \*1 |
| TC-17 | Access a published completed assignment as the owner member | The system shows the assignment correctly | Low |
| TC-18 | Access a draft planned assignment as the owner member | The system shows the assignment correctly | Low |
| TC-19 | Access a draft completed assignment as the owner member | The system shows the assignment correctly | Low |
| TC-20 | Access a published assignment as a member who is not the owner | The system shows the assignment correctly | Low |
| TC-21 | Access an assignment using a non-existing ID as a member (e.g., -1) | Access is denied | Low |
| TC-22 | Access a draft assignment as a member who is not the owner | Access is denied | Low |
| TC-23 | Access a published assignment with a different role | Access is denied | Low |
| TC-24 | Access a draft assignment with a different role | Access is denied | Low |
| TC-25 | Access a published assignment while unauthenticated | Access is denied | Low |
| TC-26 | Access a draft assignment while unauthenticated | Access is denied | Low |

\*1 This test case helped identify a bug that caused a panic view. The issue arose from loading different legs depending on whether the item was in draft mode. Once this was fixed, a new error occurred due to an incorrect CSV data sample. It has now been resolved.

#### Flight Assignment: Delete

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-27 | Delete a draft assignment as the owner member | The system deletes the assignment and its draft logs correctly | Low |
| TC-28 | Delete a draft assignment hacking some values | The system deletes the assignment | Low |
| TC-29 | Delete a published assignment as the owner member | Access is denied | Low |
| TC-30 | Delete an assignment using a non-existing ID as a member (e.g., -1) | Access is denied | Low |
| TC-31 | Delete a draft assignment via GET instead of POST as a member who is not the owner | Access is denied | Low |
| TC-32 | Delete a draft assignment with a different role | Access is denied | Low |
| TC-33 | |  |  |  | | --- | --- | --- | | |  | | --- | | Delete a draft assignment while unauthenticated |  |  | | --- | |  | |  |  | | --- | |  | | Access is denied | Low |

*Note: Coverage is below 100% due to an empty line, which is acceptable since no code is present.*

#### Flight Assignment: Publish

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-34 | Publish a draft assignment as the owner member with all conditions met | The assignment is published successfully | Low |
| TC-35 | Access the publish action over a draft completed assignment as the owner member | The publish form is displayed | Low |
| TC-36 | Access the publish action over a draft planned assignment as the owner member | The publish form is displayed | Low |
| TC-37 | Publish a draft assignment with no leg selected and any duty value | The system blocks publication and shows an error message | Low |
| TC-38 | |  | | --- | | Publish a draft assignment with a leg selected but no duty value |  |  | | --- | |  | | The system blocks publication and shows an error message | Low |
| TC-39 | Publish a draft completed assignment without modifying the leg | The system blocks publication and shows an error message | Low |
| TC-40 | Publish a draft assignment with a leg that is in draft mode | Access is denied | Low |
| TC-41 | Publish a draft assignment that has attributes with no values | The system blocks publication and shows an error message | Low |
| TC-42 | Publish a draft assignment when the member is not available (not in *available* status) | The system blocks publication and shows an error message | Low |
| TC-43 | Publish a draft assignment when there is an overlapping leg for the same member | The system blocks publication and shows an error message | Low |
| TC-44 | |  |  |  | | --- | --- | --- | | |  | | --- | | Publish a draft assignment when there is already a pilot assigned to the leg and the current duty is also pilot |  |  | | --- | |  | |  |  | | --- | |  | | The system blocks publication and shows an error message | Low |
| TC-45 | |  |  | | --- | --- | | |  | | --- | |  | |  |  | | --- | |  |   Publish a draft assignment when there is not already a pilot assigned to the leg and the current duty is also pilot | The system blocks publication and shows an error message | Low |
| TC-46 | Publish a draft assignment when there is already a copilot assigned to the leg and the current duty is also copilot | The system blocks publication and shows an error message | Low |
| TC-47 | Publish a draft assignment when there is not already a copilot assigned to the leg and the current duty is also copilot | The system blocks publication and shows an error message | Low |
| TC-48 | Publish an assignment using a non-existing ID as the owner member (e.g.,-1) | Access is denied | Low |
| TC-49 | Publish a non-draft assignment as the owner member | Access is denied | High\*2 |
| TC-50 | Publish a draft assignment when the assigned leg belongs to another airline | Access is denied | Low |
| TC-51 | Publish a draft assignment as a member who is not the owner | Access is denied | Low |
| TC-52 | Publish a draft assignment with a different role | Access is denied | Low |
| TC-53 | |  | | --- | | Publish a draft assignment while unauthenticated |  |  | | --- | |  | | Access is denied | Low |

\*2 : When testing the post-publish function with an invalid assignment ID, a panic view was displayed because a necessary check was missing.

#### Flight Assignment: Update

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-54 | Update a draft planned assignment as the owner member with all valid data | The assignment is updated successfully | Low |
| TC-55 | Update a draft completed assignment as the owner member, modifying the leg | The assignment is updated successfully | Low |
| TC-56 | Update a draft completed assignment as the owner member, without modifying the leg | The assignment is updated successfully | Low |
| TC-57 | Access the update action over a draft completed assignment as the owner member | The update form is displayed | Low |
| TC-58 | Update a draft assignment as the owner member with leg Id = 0 | An error message is displayed | Low |
| TC-59 | |  |  |  |  | | --- | --- | --- | --- | | |  |  | | --- | --- | | Update a draft assignment with a leg that is in draft mode | | |  | |  |  | | --- | |  | | Access is denied | Low |
| TC-60 | |  |  |  |  | | --- | --- | --- | --- | | |  |  | | --- | --- | | Update a draft assignment with a past leg | | |  | |  |  | | --- | |  | | Access is denied | Low |
| TC-61 | Update a draft assignment with a leg that belongs to a different airline | Access is denied | Low |
| TC-62 | Update a draft assignment with a leg that is already completed | Access is denied | Low |
| TC-63 | Update a draft assignment using a non-existing ID (e.g., -1) | Access is denied | Low |
| TC-64 | Update a draft assignment using a non-existing leg ID (e.g., -1) as a member who is not the owner | Access is denied | Low |

#### Flight Assignment: Create

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-65 | Create a new assignment as a member with valid data and valid leg | The assignment is created in draft mode | Low |
| TC-66 | Create a new assignment with a leg in draft mode | Access is denied | Low |
| TC-67 | |  |  |  |  | | --- | --- | --- | --- | | |  |  | | --- | --- | | Create a new assignment with a leg from another airline | | |  | | | Access is denied | Low |
| TC-68 | |  | | --- | | Create a new assignment with a leg already completed |  |  | | --- | |  | | Access is denied | Low |
| TC-69 | Create a new assignment using a non-existing leg ID (e.g., -1) | Access is denied | Low |
| TC-70 | Create a new assignment while logged in with a different role | Access is denied | Low |
| TC-71 | Create a new assignment while unauthenticated | Access is denied | Low |

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### Activity Log

#### Activity Log: List

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-72 | Access the list of logs of my own assignment | The system shows all activity logs (draft and published) | Low |
| TC-73 | |  | | --- | | Access the list of logs using a non-existing assignment ID (e.g., -1) |  |  | | --- | |  | | Access is denied | Low |
| TC-74 | |  | | --- | | Access the list of logs of an assignment owned by another member |  |  | | --- | |  | | |  | | --- | | The system shows only published logs |  |  | | --- | |  | | Low |
| TC-75 | |  | | --- | | Access the list of logs with a different role |  |  | | --- | |  | | Access is denied | Low |
| TC-76 | |  | | --- | | Access the list of logs while unauthenticated |  |  | | --- | |  | | Access is denied | Low |

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#### ***Activity*** Log: Show

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-77 | Access a published completed log as the owner member | |  |  | | --- | --- | | |  | | --- | | The system shows the log correctly | |  |  | | --- | |  | | Low |
| TC-78 | |  |  |  | | --- | --- | --- | | |  | | --- | | Access a draft log as the owner member |  |  | | --- | |  | |  |  | | --- | |  | | |  | | --- | | The system shows the log correctly |  |  | | --- | |  | | Low |
| TC-79 | |  | | --- | | Access a published planned log as a member who is not the owner |  |  | | --- | |  | | |  |  |  | | --- | --- | --- | | |  | | --- | | The system shows the log correctly |  |  | | --- | |  | |  |  | | --- | |  | | Low |
| TC-80 | |  | | --- | | Access a log using a non-existing ID (e.g., -1) |  |  | | --- | |  | | Access is denied | Low |
| TC-81 | |  |  |  | | --- | --- | --- | | |  | | --- | | Access a draft log as a member who is not the owner |  |  | | --- | |  | |  |  | | --- | |  | | Access is denied | Low |
| TC-82 | |  | | --- | | Access a published log with a different role |  |  | | --- | |  | | |  | | --- | | Access is denied |  |  | | --- | |  | | Low |
| TC-83 | |  | | --- | | Access a draft log with a different role |  |  | | --- | |  | | |  | | --- | | Access is denied |  |  | | --- | |  | | Low |
| TC-84 | |  | | --- | | Access a published log while unauthenticated |  |  | | --- | |  | | Access is denied | Low |
| TC-85 | |  | | --- | | Access a draft log while unauthenticated |  |  | | --- | |  | | Access is denied | Low |

#### Activity Log: Delete

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-86 | Delete a draft log as the owner member | The system deletes the assignment and its draft logs correctly | Low |
| TC-87 | Delete a draft log hacking some values | The system deletes the assignment | Low |
| TC-88 | Delete a published log as the owner member | Access is denied | Low |
| TC-89 | Delete a log using a non-existing ID as a member (e.g., -1) | Access is denied | Low |
| TC-90 | Delete a draft log via GET instead of POST as the owner member | Access is denied | Low |
| TC-91 | Delete a draft log with a different role | Access is denied | Low |
| TC-92 | |  |  |  | | --- | --- | --- | | |  | | --- | | Delete a draft log while unauthenticated |  |  | | --- | |  | |  |  | | --- | |  | | Access is denied | Low |

*Note: Coverage is below 100% due to an empty line, which is acceptable since no code is present.*

#### Activity Log: Publish

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-93 | Publish a draft log as the owner member when the assignment is published and the leg is completed | The log is published successfully | Low |
| TC-94 | Publish a draft log when the assignment is in draft mode | The system blocks the publication and shows an error message | Low |
| TC-95 | Publish a draft log when the leg is not completed yet | The system blocks the publication and shows an error message | Low |
| TC-96 | Publish a published log again | Access is denied | Low |
| TC-97 | Publish a draft log using a non-existing ID (e.g., -1) | Access is denied | Low |
| TC-98 | |  | | --- | | Publish a draft log as a member who is not the owner |  |  | | --- | |  | | Access is denied | Low |
| TC-99 | Publish a draft log with a different role | Access is denied | Low |
| TC-100 | |  | | --- | | Publish a draft log while unauthenticated |  |  | | --- | |  | | Access is denied | Low |

#### Activity Log: Create

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-101 | Create a new draft log as the owner of the assignment with valid data | The log is created in draft mode | Low |
| TC-102 | Create a log for an assignment that does not exist (e.g., ID -1) | Access is denied | Low |
| TC-103 | Create a log for an assignment owned by another member | Access is denied | Low |
| TC-104 | Create a log using a different role | Access is denied | Low |
| TC-105 | Create a log while unauthenticated | Access is denied | Low |

#### Activity Log: Update

|  |  |  |  |
| --- | --- | --- | --- |
| Test Case ID | Description | Result | Bug Detection Effectivenes |
| TC-106 | Update a draft log as the owner member with valid data | The log is updated successfully | Low |
| TC-107 | Update a published log as the owner member | Access is denied | Low |
| TC-108 | Update a draft log using a non-existing ID (e.g., -1) | Access is denied | Low |
| TC-109 | Update a draft log as a member who is not the owner | Access is denied | Low |
| TC-110 | |  | | --- | | Update a draft log using a different role | | Access is denied | Low |
| TC-111 | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | |  |  |  |  | | --- | --- | --- | --- | | |  |  | | --- | --- | | |  | | --- | | Update a draft log while unauthenticated | |  |  | | --- | |  | |  |  | | --- | |  | | | Access is denied | Low |

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## Performance Testing

### Performance charts

Performance testing was conducted to evaluate how the system performs under different hardware configurations. Execution times were collected from two different machines, referred to as PC A and PC B. The performance charts illustrate the distribution of execution times for both environments, revealing that PC B consistently achieves lower execution times compared to PC A.

Stadistical summary:

|  |  |
| --- | --- |
| *PC A* | |
|  |  |
| Mean | 22.5864587 |
| Standard Error | 1.50723968 |
| Median | 10.0599 |
| Mode | 2.6502 |
| Standard Deviation | 55.4205289 |
| Sample Variance | 3071.43502 |
| Kurtosis | 124.940384 |
| Skewness | 10.1198159 |
| Range | 861.845 |
| Minimum | 1.3612 |
| Maximum | 863.2062 |
| Sum | 30536.8921 |
| Count | 1352 |
| Confidence Level(95.0%) | 2.95678445 |

Stadistical summary:

|  |  |
| --- | --- |
| *PC B* | |
|  |  |
| Mean | 9.99837157 |
| Standard Error | 0.4039214 |
| Median | 5.3744 |
| Mode | 0 |
| Standard Deviation | 13.6140089 |
| Sample Variance | 185.341238 |
| Kurtosis | 16.7864176 |
| Skewness | 3.35782606 |
| Range | 131.6337 |
| Minimum | 0 |
| Maximum | 131.6337 |
| Sum | 11358.1501 |
| Count | 1136 |
| Confidence Level(95.0%) | 0.79251652 |

The descriptive statistics reveal that PC A shows a much wider spread of execution times (high variance and kurtosis), while PC B delivers far more stable and consistent performance.

### Confidence Intervals

To assess the statistical reliability of the results, 95% confidence intervals were calculated for the average execution times on each machine:

* PC A: mean execution time = 22.59 ms ± 2.96 ms → interval = [19.63 ms, 25.55 ms].
* PC B: mean execution time = 9.99 ms ± 0.79 ms → interval = [9.21 ms, 10.79 ms].

These intervals indicate that the observed difference in performance between the two machines is statistically significant.

### Hypothesis Testing

A z-test for two independent means was performed to determine whether the performance difference between PC A and PC B is statistically significant. The null hypothesis stated that both machines have equal mean execution times.

* The test yielded a z-score of 8.04 and a p-value < 0.0000000000000005.
* Since the p-value is far below the standard threshold (0.05), we reject the null hypothesis.

This confirms that PC B is significantly faster than PC A in executing the system operations, demonstrating that hardware configuration has a measurable influence on the system’s responsiveness.

|  |  |  |
| --- | --- | --- |
| z-Test: Two Sample for Means |  |  |
|  |  |  |
|  | *PC\_A* | *PC\_B* |
| Mean | 22.58645865 | 10.04309281 |
| Known Variance | 3071.43502 | 185.341238 |
| Observations | 1352 | 1141 |
| Hypothesized Mean Difference | 0 |  |
| z | 8.039613234 |  |
| P(Z<=z) one-tail | 4.44089E-16 |  |
| z Critical one-tail | 1.644853627 |  |
| P(Z<=z) two-tail | 8.88178E-16 |  |
| z Critical two-tail | 1.959963985 |  |

# Conclusions

This testing report provides a comprehensive evaluation of the system from both a functional and performance standpoint.

On the functional side, the test suite thoroughly covered all core features related to flight assignments and activity logs. All functionalities behaved as expected under normal and boundary conditions, and proper access control was enforced across roles and authentication states. Although most test cases had low bug detection effectiveness—indicating a robust implementation—at least one critical bug was successfully identified and resolved. Moreover, the coverage was almost 100%.

On the performance side, execution time metrics were gathered on two machines (PC A and PC B) to assess how hardware affects system responsiveness. The results showed a clear performance advantage in favour of PC B. Confidence intervals demonstrated that the differences in execution times are statistically reliable, and hypothesis testing confirmed that PC B outperforms PC A with high significance.

In conclusion, the system not only satisfies the functional requirements with strong stability and correctness, but it also performs efficiently in favourable hardware environments. These results validate both the quality of the implementation and the effectiveness of the test strategy.

# Bibliography

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