Document: AV-SIM-ITP-V1.0

Title: Avionics Simulation System Integrated Test Plan

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1. Introduction

This Integrated Test Plan (ITP) details the procedures and expected results for verifying that the Avionics Simulation System (AV-SIM) meets all defined functional and non-functional requirements as specified in AV-SIM-SRS-V1.2.

2. Test Environment

The tests will be conducted utilizing the hardware and bus architecture detailed in AV-SIM-HW-V1.0, connected to a dedicated Real-Time Host (RTH).

3. Test Cases

3.1 Timing Performance Verification

- **Target Requirement:** REQ-NFP-101 (100 Hz Update Frequency).
- **Objective:** To verify that the end-to-end simulation cycle time, including FDM calculation and output refresh, reliably meets the required frequency.
- **Procedure:**
    1. Load a flight profile representing maximum computational load (high atmospheric turbulence, rapid control surface changes).
    2. Use the RTH clock to timestamp the start and end of 10,000 consecutive full simulation cycles.
    3. **Expected Result:** The average cycle duration must be less than 10.0 milliseconds, and no individual cycle shall exceed 10.5 milliseconds.

3.2 Actuator Command Redundancy Verification

- **Target Requirement:** REQ-CIP-005 (Triple-Modular Redundancy).
- **Objective:** To verify that the fault-tolerant mechanism maintains full control authority even after multiple failures.
- **Procedure:**
    1. Initiate a steady-state flight profile.
    2. Force a simulated internal failure on the **first processing channel** of the Primary Flight Computer (PFC) module. Verify command output is unaffected.
    3. While the first channel is failed, force a simulated internal failure on the **second processing channel**.
    4. **Expected Result:** The system must continue to output valid, active control commands based on the live FDM state, demonstrating continued operation through the remaining active channel(s).

3.3 6DOF Fidelity Check

- **Target Requirement:** REQ-FDM-001 (6DOF modeling fidelity).
- **Objective:** To verify the FDM's accuracy against a known truth model.
- **Procedure:**
    1. Execute a set of pre-defined maneuver scripts (e.g., 180° turn, pull-up, steady glide).
    2. Compare the resulting state vectors (position, velocity, Euler angles) against the reference truth model data.
    3. **Expected Result:** The Root Mean Square (RMS) error between the simulated and truth data shall not exceed 5% across all six degrees of freedom.