Horizon Project - Navigation System Assessment

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Introduction

This assessment is part of the Horizon Project's initiative to evaluate the aircraft navigation system's performance under adverse environmental conditions. The primary task involves identifying potential system issues in low-visibility environments, such as heavy fog, and developing a comprehensive troubleshooting framework.

Ensuring accurate and reliable navigation is critical for flight safety and mission success. This investigation will support improvements in system performance, enhance safety margins, and contribute to the broader objectives of the Horizon Project.

Research and Information Gathering

- Objective:
  To collect all relevant data on current system performance, failure modes, and environmental impact on navigation functionality.
- Steps:
  1. Review maintenance logs and incident reports in the past
  2. Interview flight crew and maintenance personnel.
  3. Collect technical specifications and manufacturer data sheets.
  4. Analyze system integration with environmental sensors.

- Resources:
    1. Aircraft maintenance records database
    2. Flight data monitoring system
    3. Manufacturer technical manuals
    4. Industry databases such as FAA incident reports
    5. Navigation system diagnostic tools

Simulation Planning

- Objective:

    To evaluate the navigation system's accuracy, response time, and error handling under simulated low-visibility conditions.

- Method:
    1. Use Flight simulation software
    2. Replicate real-world environmental scenarios such as dense fog and minimal visibility.
    3. Integrate real-time weather input
    4. Monitor system logs for anomalies
- Expected Outcomes:
    1. Sensor lag or failure points.
    2. Software or algorithmic limitations.
    3. Correlate navigation accuracy with visibility conditions.

Identification of Potential Factors

- Objective:

    To isolate and classify variables that may affect navigation reliability in adverse conditions.

- Approach:
    1. Perform fault tree analysis (FTA)
    2. Inspect hardware for wear, corrosion, or interference issues.
    3. Review firmware and software error logs.
- Criteria for Evaluation:
    1. Impact severity on navigation accuracy or reliability.
    2. Field test environments.

Documentation Guidelines

- Objective:

    To ensure a clear, traceable, and standardized record of findings that support future troubleshooting and design improvements.

- Format:

    Use standardized templates for issue logging, such as NASA-style Problem and Corrective Action forms.

- Details to Include:
  1. Date, time, and condition of observation
  2. Affected subsystems and location
  3. Data logs and system responses
  4. Root cause analysis and supporting evidence

Conclusion

This assessment outlines a structured approach to diagnosing navigation system issues within the Horizon Project framework. Through thorough research, simulation, and detailed documentation, the investigation aims to improve system performance, ensure compliance with safety regulations, and contribute to long-term reliability improvements. The systematic evaluation of contributing factors will be critical in preventing navigation-related failures in future missions.