



CASE STUDY

Client: Private organization in the domain of space and defense

Location: India

INTRODUCTION

The client required functional testing and simulation support for an avionics subsystem under development. The objective was to validate performance parameters, system reliability, & signal integrity under operational conditions — without disrupting ongoing test schedules at the client's facility.

Software Layer: LabVIEW™ and Python-based automation with graphical dashboards and safety interlocks.

HIL Integration: Real-time simulation of flight parameters and mission control signals.

The Aapah engineering team adopted a Design-for-Testability (DfT) and Model-Based Systems Engineering (MBSE) approach. sub-system — including mechanical actuators, sensor simulators, and data acquisition modules

TECH. COMPLIANCES

Aapah Innovations (AIPL) was engaged as a technical testing partner, providing on-site engineering support and test setup development using the client's available infrastructure and instruments. Our role was to design, configure, and execute simulation-based validation routines, ensuring accuracy, traceability, and compliance with relevant defense testing practices.

Custom Mechanical Design: Rigid frame with anti-vibration isolation mounts and precision load application.

Control Electronics: FPGA-based signal conditioning for analog/digital I/O

VERIFICATION AND TESTING

Testing was executed at the client's site using their qualified test environment.

The scope included:

- Functional validation of analog and digital I/O channels.

- Load simulation through controlled voltage and current sources.

- Fault injection testing to assess system response to abnormal conditions.

CHALLENGES

- Thermal drift evaluation across limited temperature ranges.
- EMI/EMC observation in coordination with the client’s compliance cell.

Our team ensured that every result was logged and verified in alignment with the client’s internal test procedure templates.

- Synchronizing different test instruments and data interfaces.
- Maintaining stable signal conditions during long-duration tests.
- Ensuring accurate timing synchronization for real-time loops.

APPROACH

Activity	Technical Execution	Outcome / Benefit
Setup Design	Defined test parameters, simulation logic, and wiring layouts tailored to the client’s hardware and instrumentation.	Ensured full compatibility with existing systems and reduced setup time.
Integration	Connected power, sensor, and control interfaces using custom-built harnesses and signal adapters.	Enabled stable connectivity and minimized signal losses during trials.
Automation	Developed lightweight LabVIEW™ and Python scripts for repetitive test cycles and real-time data capture.	Reduced manual effort and improved data repeatability and accuracy.
Execution	Performed on-site testing with live systems, monitoring electrical, thermal, and signal responses.	Validated operational performance under controlled real-world conditions.
Data Analysis & Reporting	Logged high-frequency data, generated automated CSV/PDF reports, and reviewed results with client engineers.	Provided traceable, audit-ready documentation for design verification.

FINAL DELIVERABLES

- AIPL–client effort resulted in a **fully functional, site-deployed test setup** that achieved all target validation objectives without additional hardware investment
- Functional Test Bench setup design documentation.
 - Test procedure scripts (LabVIEW/Python).
 - On-site execution report and observation summary.
 - Test data logs and validation certificate (jointly signed with client)

Through hands-on collaboration, Aapah Innovations successfully demonstrated its capability to design and execute test benches and simulation processes at client facilities — combining engineering expertise, adaptability, and compliance discipline.

