ENVITEST LABORATORIES PRIVATE LIMITED

Real-World Challenges + Controlled Testing = Stronger Products

Improving Reliability Through Lab Validation and Field Learning

In product development, one common misconception continues to mislead teams: *"If my product passes all laboratory tests, it should never fail in the field."* While laboratory validation is critical, real-world performance depends on countless unpredictable factors that no controlled setup can fully replicate. At Envitest Lab, we help customers understand the connection between laboratory failures and field failures — why both matter, how they differ, and how integrating the insights from both leads to stronger, more reliable products.

Laboratory failures occur in a controlled, repeatable test environment, making them extremely valuable for engineering analysis. Every test parameter — temperature, vibration, humidity, shock, electrical load, or electromagnetic exposure — is measured, monitored, and precisely logged. When a failure occurs, engineers can clearly identify what failed, when it failed, and under exactly which conditions. This traceability makes lab failures structured, predictable, and easier to diagnose.

Despite the sophistication of lab tests, real-world environments remain inherently unpredictable and untraceable sometimes. Field failures expose how a product behaves under actual usage — where conditions remains constant or fluctuate, user behaviour varies, and multiple stressors interact simultaneously. Real installations bring additional variables such as handling quality, assembly variations, natural environmental exposure, unexpected duty cycles, and human factors like misuse or incorrect installation.

How Envitest Lab Connects Lab Insights with Field Realities

Envitest Lab plays a crucial role in bridging the gap between laboratory behavior and field performance. Our engineering team works closely with customers to correlate field failures with lab test profiles. We analyse what failed, under what conditions, and whether the existing qualification tests adequately cover real operational scenarios. This helps identify gaps between design assumptions and actual usage environments.

Through advanced simulation, endurance rigs, data logging, and teardown analysis, we recreate field failures in controlled lab settings to identify the true root cause. Based on these insights, we help customers strengthen validation programs by modifying test profiles, adding combined stress conditions, or updating specifications. This creates a stronger feedback loop, where field learnings refine test methods and lab learnings refine the product design.

Effective reliability engineering respects both sources of insight. Lab failures help refine the design by highlighting weaknesses early and in a controlled setting. Field failures help refine the test methodology by revealing real-world conditions that may not have been previously considered. Together, they create a closed-loop system that continuously improves product durability, performance, and safety.

Where others see samples and schedules, we see purpose and performance. We take the time to understand each product — its design intent, usage environment, and potential failure modes. This approach helps us simulate real-world conditions more effectively, ensuring that the validation we deliver has practical meaning. As industry expectations evolve, we focus not just on test execution, but on lifecycle reliability, customer behaviour, and usage reality.

We test with the mindset of a partner, not a vendor. The goal is not only to complete tests but to deliver insights that strengthen product design, enhance reliability, and protect brand reputation. Whether it's aerospace, automotive, or defense equipment, we ensure every result reflects technical depth and clarity.

If repeatability exists, we engage the manufacturer to redesign the part or material. Whether one is facing unexpected field complaints or building a robust validation plan, Envitest Lab supports you every step of the way with clarity, insight, holistic understanding, and technical excellence.

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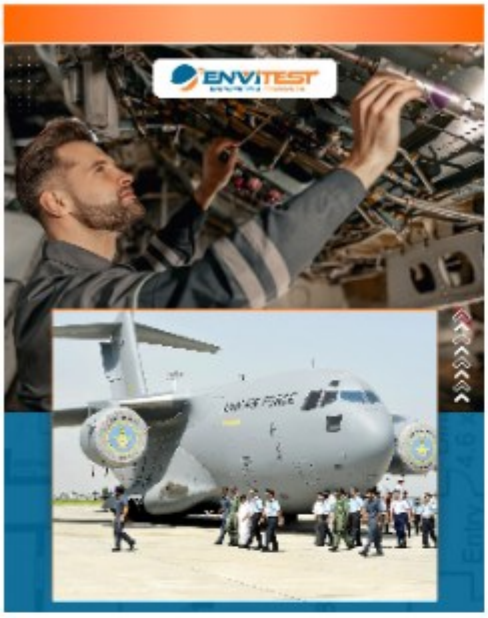
Special points of interest

Envitest Lab and ELSN have signed an MoU to collaborate and strengthen testing capabilities, knowledge sharing, and technical development.

This partnership aims to create better opportunities for advanced testing, skill enhancement, and industry support. Together, we look forward to building value, and expanding expertise.

RTCA DO-160: The Global Benchmark for Airborne Equipment Qualification



Every component installed on an aircraft — from flight computers and sensors to entertainment systems and power modules — must withstand a combination of environmental extremes and electromagnetic disturbances. To standardize this evaluation across the aviation industry, the RTCA established DO-160, the world's most widely accepted qualification standard for airborne electronic equipment.

RTCA DO-160 defines framework of tests to ensure that airborne systems perform safely, consistently, and predictably under real operating conditions. It is not just a test standard — it is a certification foundation that supports the global aerospace ecosystem.

RTCA DO-160, formally titled *Environmental Conditions and Test Procedures for Airborne Equipment*, is a globally recognized qualification standard followed by aerospace manufacturers, OEMs, testing and certification authorities. It defines the full range of environmental, mechanical, climatic, and electromagnetic conditions that avionics and airborne electrical equipment must withstand throughout their operational life cycle. The purpose of DO-160 is to ensure that every system installed on an aircraft can survive and function reliably across all phases of flight — from ground operations, take-off, and landing to high-altitude cruise, turbulence, and continuous vibration. It also accounts for real-world stressors such as icing, humidity, rapid temperature variations, electrical anomalies, RF emissions, power disturbances, and even lightning strikes. By simulating these conditions in a controlled and repeatable manner, DO-160 forms a critical foundation for airworthiness qualification, ensuring that no piece of onboard equipment becomes a point of failure in flight.

RTCA DO-160 is global qualification standard for electronic or electrical system installed in an aircraft—whether commercial, military, private, UAV, or eVTOL—must prove that it can function safely and reliably under a wide range of environmental and operational stresses. .

Envitest Lab's Role in DO -160 Qualification

At Envitest Lab, we support aerospace manufacturers through comprehensive DO-160 qualification services, including:

- Environmental simulation
- Vibration & shock testing
- Power input and surge testing
- EMI/EMC testing
- Lightning & ESD simulation
- Detailed failure analysis
- Compliance documentation support

Our engineering-driven approach ensures customers not only pass tests — but understand how to build more reliable products.

Who Requires DO-160 Qualification?

RTCA DO-160 compliance is mandatory for virtually all electronic and electrical equipment intended for installation on any type of aircraft — commercial, military, business jets, rotorcraft, UAVs, and emerging eVTOL platforms. Since airborne systems operate in dynamic, harsh, and safety-critical environments, every component that interfaces with the aircraft's electrical power, communicates with other avionics, or performs any operational function must pass DO-160 environmental and EMI/EMC qualification.

Avionics manufacturers. All core avionics units—flight displays, control computers, autopilot systems, communication radios, navigation receivers, TCAS, transponders, and engine control modules—must undergo DO-160 testing. These systems interact directly with the safety and operation of the aircraft.

Flight control systems and cockpit electronics. This includes fly-by-wire controls, actuators, sensors, position feedback units, and any electronic control hardware inside or near the cockpit environment. Since these devices operate continuously during flight, they must perform flawlessly.

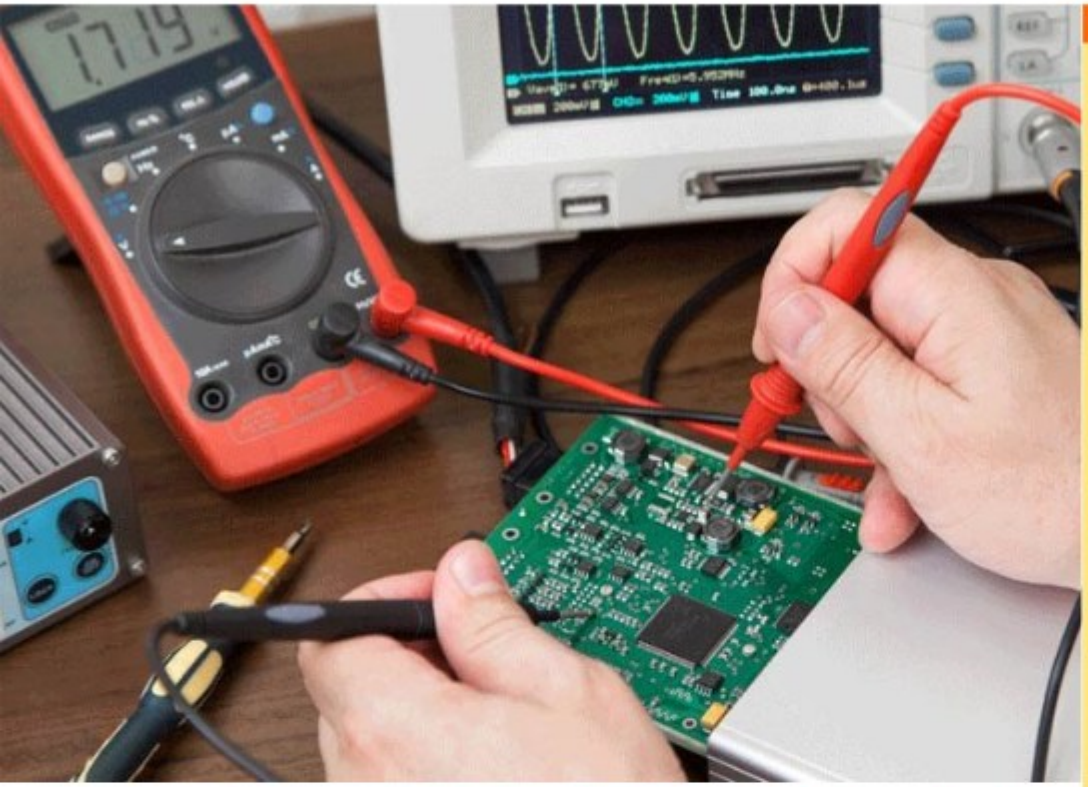
Cabin systems. Lighting controllers, audio/video modules, passenger service units, and Wi-Fi or entertainment equipment require DO-160 qualification as well. Even though they are not flight-critical, they are still integrated into the aircraft electrical network and must meet EMI, power input, and environmental limits.

Power conversion units—like AC/DC converters, inverters, battery chargers, and distribution modules—must also be DO-160 compliant because they supply or regulate power to other critical equipment. Their failure can cascade into multiple subsystems, making qualification essential.

Radar, communication, and sensor modules used for surveillance, weather detection, terrain awareness, or satellite communication require DO-160 testing to ensure they continue functioning reliably despite varied environmental conditions, g-forces, electrical noise, altitude pressure, or lightning exposure.

UAVs, drones, and eVTOL aircraft the new-age aviation platforms, with their power systems, flight modules, controllers, and communication electronics must prove durability equivalent to manned aircraft provide accurate data in all environmental stresses.

Batteries, data recorders, emergency systems, and supplemental electronic modules require DO-160 compliance. Even small equipment—USB chargers, LED drivers, or interface boards—must qualify if connected to the aircraft's electrical architecture.



Why Testing Sounds Like Failure: A Psychological Perspective on Evaluation and Success

Testing, whether in engineering, product development, or scientific validation, is often subconsciously associated with failure. When a component does not pass a test, the common reaction is discouragement — a feeling that something has gone wrong. But this perception is rooted more in human psychology than technical reality. In most disciplines, testing is not designed to prove success; it is designed to reveal weaknesses, validate assumptions, and determine whether a product can endure real-world demands. Naturally, this means encountering outcomes that may not be favorable at the first attempt.

The psychological connection between testing and failure can be explained by a few principles. First is the fear of judgment — when results are documented, reviewed, and evaluated, individuals may interpret outcomes as a reflection of their personal competence. Second is loss aversion, a behavioral science concept that states people experience the pain of loss more intensely than the satisfaction of gain. A failed test feels like a loss, even though it is a crucial step towards improvement. Finally, our long-conditioned academic mindset associates evaluations with passing or failing, rather than learning and refining.

However, testing plays a far more powerful role. It provides clarity, direction, and evidence-based improvement. Each unsuccessful test result is a data point — not a verdict. It tells us where the system stands today and what must change to achieve tomorrow's performance benchmarks. In industries like automotive, aerospace, defense, and consumer electronics, testing prevents catastrophic field failures, enhances safety, accelerates innovation, and builds credibility. In reality, testing is a structured form of progress.

At Envitest Laboratories, we recognize the emotional and technical challenges teams experience during testing cycles. Instead of treating test outcomes as a binary pass/fail checkpoint, our approach transforms them into learning milestones. Our experts work closely with researchers, engineers, and product designers to help them interpret results correctly — not with fear, but with confidence and clarity. We guide teams in understanding root causes, planning corrective actions, and optimizing designs to meet compliance requirements with precision.

From solving complex field failures or building a reliability framework, at Envitest Lab, we do not just execute tests — we empower confidence, strengthen understanding, and help turn uncertainty into assurance.

The Psychological Lens

Structured and Predictable Workflows:

Envitest ensures that every testing engagement follows a clear and organised process, eliminating ambiguity and making execution smooth and predictable for all stakeholders.

Transparent Communication:

We maintain open communication—from test planning to execution and reporting—so organisations always know what is happening, why it's happening, and what comes next.

Seamless Integration into Product Development:

Instead of treating testing as a post-design hurdle, Envitest aligns test activities with development cycles, making validation a natural and essential step toward product maturity—not a disruption.

Global-Standard Compliance:

With strict adherence to ISO/IEC/IS 17025 and sector-specific requirements, supported by modern calibrated equipment, Envitest delivers reliable, credible, and globally accepted test outcomes.

Cross-Domain Expertise and Technical Depth:

Our experience across research domains ensures that clients benefit from tested methodologies, engineering insights, and application-specific recommendations.

Transforming the Mindset from Fear to Progress:

At Envitest, testing is not framed as a verdict on product failure but as an opportunity for refinement. Every deviation, non-conformity, and insight is treated as a step toward excellence—helping organizations build confidence, capability, and better products.

Purpose of the Sunshine Test

To determine the heating effects of direct solar radiation on equipment or materials when exposed to sunlight.

To evaluate the actinic effects, including photo-degradation, caused by UV exposure, which may lead to discoloration, embrittlement, loss of mechanical integrity, or reduced performance.

MIL STD 810 Test Procedures

1. **Temperature Effects (Cycling)**: This evaluates how solar loading affects the temperature rise of the material or system.
2. **Actinic Effects (Steady State)**: This procedure simulates long-term UV exposure conditions to determine the degradation effects sunlight on the material's chemical and physical structure.

Our expertise includes:

State-of-the-art solar simulation chambers capable of controlled radiation, temperature uniformity, and long-duration exposure profiles.

ISO/IEC/IS 17025:2017 accreditation, ensuring traceability, precision measurement, and globally recognized test validity.

Customizable test conditions based on product application, climatic exposure maps, and end-use profiles.

Detailed data recording and engineering analytics, helping customers understand not only what failed — but why and how to improve.

Cross-industry experience, supporting aviation, defense, medical devices, automotive components, and high-reliability industrial equipment.

Facing the Sunshine: MIL-STD-810 Solar Radiation Testing

Solar radiation is one of the most demanding natural environmental stressors for equipment deployed in outdoor, high-temperature, and sun-exposed conditions. Whether used in defense platforms, aerospace applications, automotive systems, renewable energy installations, or ruggedized industrial environments, materials and electronic assemblies can face extreme thermal loading and ultraviolet (UV)-driven degradation throughout their lifecycle.

The MIL-STD-810 Solar Radiation Test (Method 505) is specifically designed to evaluate a material's behaviour under prolonged sunlight exposure and simulate the effects of solar heating and photo-degradation. This test helps predict how equipment will perform and survive in environments dominated by high solar intensity, such as tropical deserts, high-altitude deployment locations, or outdoor field-operating conditions.

Envitest Laboratories Pvt. Ltd. delivers fully compliant and technically robust solar radiation testing aligned with MIL-STD-810 Method 505, leveraging advanced infrastructure and experienced test engineering capability.

Raising the Standard: ISO 17025 Defines Our Testing Philosophy

ISO/IEC 17025 is the foundation of trusted testing. At Envitest Lab, we take this standard seriously because it ensures that every test result is accurate, traceable, and globally recognised. This accreditation validates our technical competence and reliability of our testing systems, personnel expertise, equipment, and documented methods.

For our customers, ISO 17025 serves as a clear assurance: the results they receive are consistent, credible, and aligned with international benchmarks. This builds confidence, supports compliance with regulatory frameworks, and facilitates smooth acceptance of test reports across borders — especially crucial for industries engaged in global trade and certification.

By adhering to ISO 17025, Envitest Lab holds commitment to quality and CI.

Testing the Future Faster: Precision Under Pressure

Testing laboratories carry a unique responsibility — we simulate years of real-world usage in days, weeks, or sometimes even hours. This accelerated evaluation allows manufacturers to understand how their product behaves under stress, vibration, temperature extremes, UV exposure, humidity, corrosion, endurance cycles and more — long before the product reaches the market. The expectation is simple yet demanding: *even when time is compressed, accuracy cannot be compromised*.

When tests compress timelines, every parameter, method, and decision matters. There is no room for approximation. The results must reflect reality, not just laboratory conditions. This is what makes testing a high-stakes function in product development — it protects reputation, ensures safety, and validates reliability before deployment.

At Envitest Lab, we do not merely run tests — we replicate real-world scenarios with precision, consistency, and traceability. Our processes are supported by ISO/IEC 17025 principles, calibrated systems, skilled experts, and controlled workflows that ensure every result represents true product performance.

Testing Is Not Monotonous — It's Medicine for Products

Many people believe testing is stagnant, repetitive, or undervalued. They see test labs as the last stop in the development chain — a place where products are judged, approved, or rejected. But I have always told my team and the industry one simple truth:

We are equivalent to doctors — just that we treat products, not people.

A good test engineer does not merely run procedures; they diagnose symptoms, interpret signals, identify failure patterns, and prescribe corrective actions. Just like a physician understands anatomy, physiology, and diseases, a testing professional understands materials, failure modes, real-world environments, and behavior. Roles demand accuracy, patience, curiosity, and responsibility — because decision impact products, reliability, and trust.

Testing is where innovation becomes reality, assumptions are challenged and improvements are born. Every test tells a story about durability, safety, and long-term performance. Without testing, products would only hope to survive. With testing, they prove they can.

At Envitest Lab, we treat every test like a consultation. We ask the right questions, study symptoms, and analyze data until the root cause and path to improvement are clear. We believe testing is not a barrier — it is a bridge between idea and excellence.

At Envitest Lab, Root Cause Investigation practice has evolved into an organisational mindset — where failure is not a dead-end but a signal that something meaningful needs attention.

Mastering Root Cause Investigation: The Envitest Approach to Quality and Reliability

A few days ago, a customer approached us with frustration — *"No matter what we do, our unit keeps failing the test."* We listened silently for a moment—not to respond, but to understand. Then we shared something honest: *"Even we face challenges with our own test equipment at times. When that happens, we don't stop—we investigate."*

We explained how we rely on structured Root Cause Investigation (RCI) techniques, diving into history logs, repeatability patterns, and previous corrective actions. If a failure is consistent, we either work with the vendor to revise the design or component—or we redesign our execution method until the outcome is accurate and reliable. That conversation changed the customer's perception: failure wasn't a dead end; it was an entry point to improvement.

Over the years, Envitest Lab has embedded Root Cause Investigation as a core discipline within our Quality Management System. Instead of treating non-conforming results as problems to hide or bypass, we treat them as valuable signals. Our methodology combines systematic analysis tools—like 5 Whys, Fishbone Diagrams, FMEA inputs, and process capability checks—with real-world experience gained through diverse testing domains.

Mastering RCI has enabled us to avoid repeating errors, enhance traceability, strengthen corrective and preventive actions (CAPA), and continuously raise the standard of execution. This approach ensures every test outcome—pass or fail—is meaningful, explainable, and actionable.

By applying RCI consistently, we have built a culture where quality is not a department—it is a mindset. Today, Envitest Lab is recognised not just for executing tests—but for helping customers understand why something performed the way it did. Root Cause Investigation has become our backbone, enabling us to deliver reliability, confidence, and best-in-industry practices—where failure becomes learning, and learning becomes excellence.

About Envitest Lab

Our Services

- Climatic Simulations
- Dynamics & Vibration
- Contamination and Ingress
- Materials / Metallurgical Testing
- Aircraft Electrical Testing
- Electrical Safety Testing
- Optical Fibre Cable Testing
- Optical Fibre Connector Testing
- Telecom Interface Testing
- Electrical Cables Testing
- Electrical Connectors Testing
- International Approvals
- Customized Tests
- Engineering Services

At Envitest Laboratories, we started with a clear mission—to empower products by ensuring they are tested accurately and proven reliable. Established in 2017 in Bangalore Electronic City, Envitest is an ISO/IEC 17025-certified company dedicated to providing high-quality testing, inspection, pre-compliance, certification, and engineering services across industries worldwide.

As industries evolve, so do their testing needs. Over the years, we have continuously expanded our testing capabilities, enabling us to offer a comprehensive portfolio of solutions that help manufacturers meet regulatory and quality standards. From a humble test house to a leading global provider of standard and customized testing services, our journey has always been guided by one principle—customer-first approach and delivering precision in every test.

Our Expertise in Testing Disciplines

⇒ Electronics & Electrical Product Testing – We ensure reliability for optical fiber, electrical connectors (automotive & MIL), aircraft electrical characteristics, product safety, performance, and susceptibility testing.

⇒ Telecom Product Testing – Our expertise covers PON and GPON testing, interface testing, EMI/EMC testing, router and switch evaluations, and more.

⇒ Environmental Testing for Any Product – We conduct shock & vibration, bump, thermal cycling, humidity, damp heat, extreme temperatures, thermal shock, ingress protection (dust & water), contamination, fungus resistance, ultraviolet (UV) exposure, salt & acidic corrosion, and more.

At Envitest Lab, we believe that doing things right isn't just a process—it's a commitment to quality. With cutting-edge facilities and a highly skilled team, we help industries launch safer, more reliable, and high-performing products into the market with confidence and compliance.

Empowering Products. Excellence in Testing. Confidence in Performance. Setting Standards.

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