



Environmental Testing

Understanding Validation Methods
for COTS, RCOTS, and MCOTS

A White Paper by Digital Systems Engineering

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Today's harsh environments command equally hardened electronic components, such as Digital Systems Engineering's (DSE) rugged displays, to meet a multitude of environmental standards. Common requirements include military and aerospace standards like MIL-STD-810, MIL-STD-461, MIL-STD-1275, MIL-STD-704, MIL-STD-901, MIL-STD-3009, IP ratings, and DO-160.

The goal of this white paper is to help customers understand the role of COTS products in the defense marketplace, various methods of validation, and the DSE methodology to deliver compliant systems.

COTS and its Derivatives

In recent history, the defense industry has transitioned from specifying custom OEM designed electronics to a generalized procurement approach which looks to utilize commercial-off-the-shelf (COTS) technologies. This effort has proven to reduce NRE, unit costs, the development cycle, and production lead times.

The Evolution of COTS

While the COTS term was originally born in the mid-90s, the trend has gained momentum in the last 8-10 years. Even more recently new categories have been coined with industry terms such as RCOTS (rugged COTS) and MCOTS (modified COTS). These variations have been adopted as a means to realize the advantages mentioned above while having greater flexibility in the functionality and performance of electronic systems.

Manufacturers seeking to capture contracts have responded. Working in concert, defense contractors and manufacturers have collaborated to revise ICDs, specifications, and statements of work to reconfigure COTS products. The end result is a product delivered more quickly, less costly, and slightly modified, all the while leveraging proven technologies and processes. But what about environmental qualification requirements?

COTS AND ITS DERIVATIVES

With the shift to COTS, along came the expectation that all products were to be pre-qualified. While in some instances this was the case, many times COTS electronics were designed for a variety of industries which don't require the same set of standards.

To further complicate the matter, a migration to MCOTS raises the question as to whether or not previous testing is valid if the two products aren't exactly the same.

Considering the main advantages of COTS products, it is no wonder why the U.S. Government has pushed strongly for this diametric shift. However for many manufacturers the financial implication of testing all products to the gamut of certifications, which can be upward of \$100,000, is simply unrealistic. This impracticality is exasperated if the organization relies on a robust product portfolio.

The defense industry has come to realize the struggle technologically innovative companies face if bound with this responsibility. As a result, a new dialogue has been born.

Are third party tests required? Who will be responsible for managing and funding the tests? Can tests on similar products be analyzed and deemed relevant in lieu of test reports? Is validation at a component or at a system level fitting?

The DSE Approach

As a nimble, engineering-centric organization, DSE has welcomed the demand for COTS, RCOTS, & MCOTS products.

Utilizing established product lines through a modular methodology allows for not only decreased NRE figures and time to market, but also a synergy in design and production.

Components such as video cards, power supplies, enclosures, LCDs, connectors, and more are used in multiple product families to give an assurance of compliance.

Choosing a Validation Method

A collaborative effort between the purchasing entity and manufacturer determines which validation method is most appropriate: by design, analysis, similarity, or third party test?

DSE's general position is to market products under the *meets by design* designation. With dozens of configurations successfully tested, a solid engineering background and past experiences, it is reasonable to predict a compliant product.

This type of declaration requires an in-depth conversation to explain what design steps were taken to warrant the claim.

Meets by similarity becomes relevant when a slightly different configuration has been previously tested and there are substantial reasons to deem the results are valid for multiple products.

In some cases, representative DSE test reports are shared to support the discussion. A full understanding of the differences between product A and product B is critical to determine the validity of similarity.

CHOOSING A VALIDATION METHOD

To this end, DSE implements similar design techniques including component selection, coating processes, isolation methods, connector sets and user interfaces across product designs. Additionally, manufacturing processes like torque settings, sealing practices, and acceptance test procedures are also similar.

In some cases, *meets by analysis* can be used in lieu of tests. For example, a fully sealed product that meets the IP67 rating for water immersion will undoubtedly pass the MIL-STD-810F humidity test. Where applicable, an analysis of testing methods, material properties, and components can be a sufficient alternative to a third party confirmation.

If a customer determines none of the three alternative methods above are suitable, certification via *test* will be needed.

Third Party Testing

After it has been determined a test is needed, DSE will offer to manage and fully guarantee passing results to the agreed upon validation parameters. Employing long standing relationships with world class third party laboratories, the customer can be assured all reports will exceed contract requirements.

In conclusion, the trend to field off-the-shelf products has proven to keep our military and aerospace platforms technologically advanced at a fraction of the cost of fully customized systems.

While there will always be a demand for specialized products, COTS are the answer to smaller budgets and restricted timelines. In an era of ever changing designs, collectively we must consider validation testing methods and what is appropriate for each effort.



Want to Learn More?

Visit digitalsys.com to learn more about our COTS solutions, or call (480) 515-1110 to request a custom proposal.

About Digital Systems Engineering, Inc.

Since 1995, as a privately held U.S.-owned small business (FAR 19.102), DSE has achieved an international reputation for excellence in the design and manufacture of leading-edge technology-driven display and computer products. DSE has a long-standing history of exceeding customer expectations in the ongoing development of mutually beneficial business relationships.



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