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eXpress™ Newsletter

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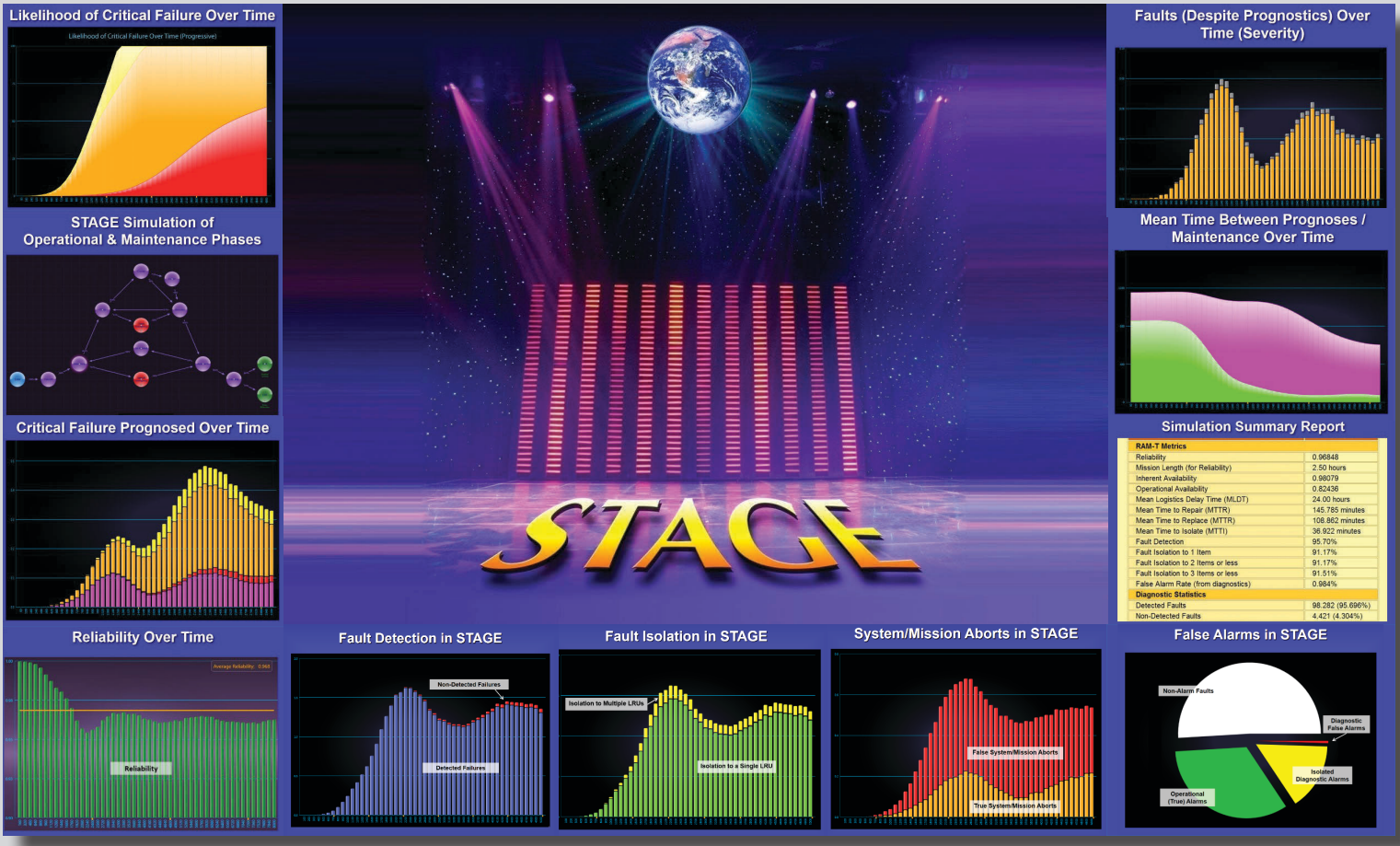
Developing Systems for Effective Sustainment

Traditional embedded System Health Management systems typically fail to take full advantage of the knowledge that can be gleaned from on-board BIT. Because of this, the "bridging" of diagnostic conclusions from on-board to off-board may be substantially compromised. Moreover, other shortcomings of these traditional development approaches typically manifest themselves in the sustainment lifecycle as NFFs, CNDs, RTOKs and False Removals.



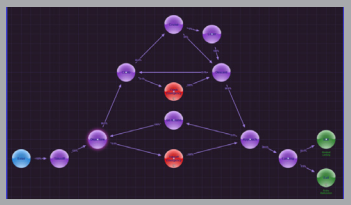
Design Development activities typically dismiss diagnostic engineering until the design is too far along, resulting in numerous missed opportunities. A system's sustainment capability thus suffers unnecessarily from these traditional, diagnostically compromised approaches. This occurs frequently in today's programs, since development funding is almost always divorced from sustainment funding. As such, many design development practices significantly miss their chance to achieve excellence in sustainment. Additionally, this allows developers to blame any ensuing sustainment inefficiencies on their not having been required to conform (or be accountable) to specific "design for sustainment" requirements. ...*Continued on page 2*

Inside this Issue...

New Capabilities Coming to STAGE!

DSI is proud to announce new capabilities in STAGE which will enable greater flexibility and accuracy when conducting Simulations of Operational & Maintenance Phases.

....more to come!



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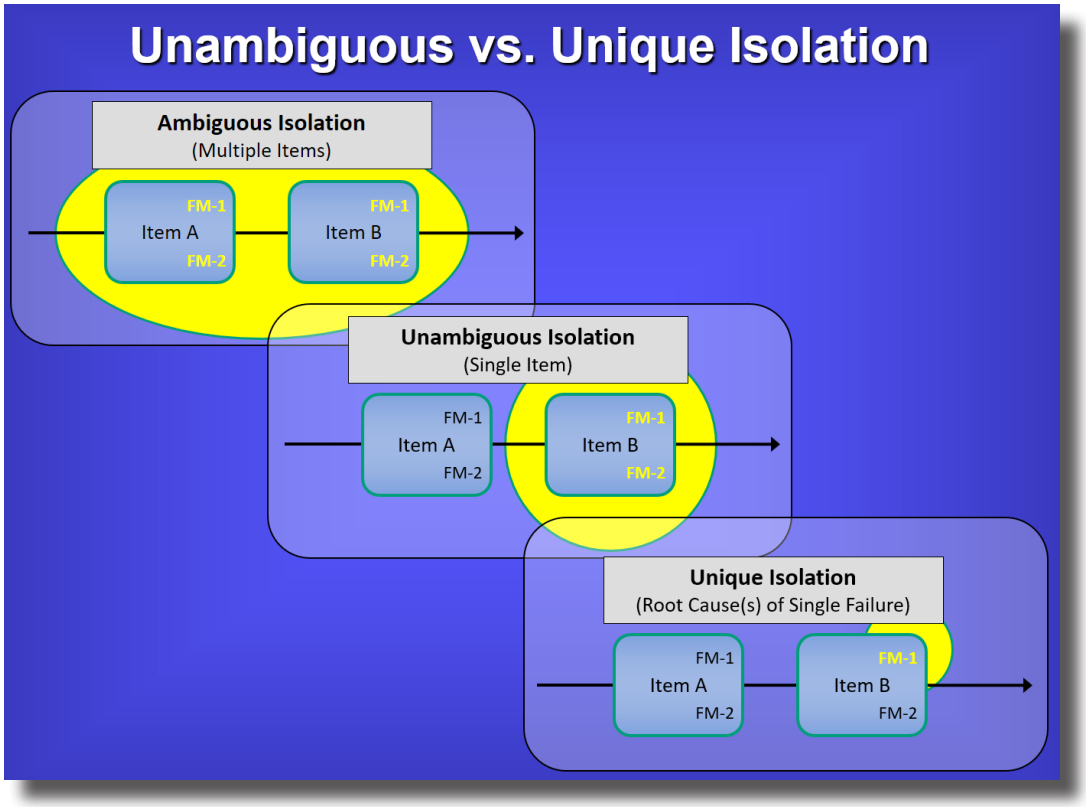
The chart to the right depicts the distinction between failure isolation capability and associated constraints.

When two(2) or more replaceable items are determined to be the lowest possible group of items to contain a failure, then both items in this Fault Group must be replaced due to this "Ambiguous Isolation".

When the diagnostics isolates to one (1) replaceable item, then the Fault Group contains only one (1) item in this "Unambiguous Isolation".

When the diagnostics capability can isolate between any of the functions or failure modes on the items, then this enables the ability to "Uniquely Isolate" the failure. In such event, this capability in eXpress is referred to as "Failures Uniquely Isolated", or "FUI".

Determining the design's FUI is essential to achieving aspirations of high-end diagnostic capability and ambitions of operational or sustainment effectiveness.



The "Unique Isolation of Failures" or "FUI" is a simple output that results from the capturing of any test coverage (including BIT) within each design contained in a large, critical or complex asset. It will initially consider the diagnostic constraints of every design and the aggregate diagnostic capability resulting from the system's integration of each of the designs within any hierarchical representation. The test coverage will reflect such diagnostic constraints and the impact of these constraints throughout the interdisciplinary design assessment products throughout design development.

Should each integrated design be capable of declaring if any critical function is able to be "Uniquely Isolated" at any level of the design, while considering the (BIT) test coverage and any possible design constraints on that diagnostic certainty? Is it obvious how we can suggest improvements or derive any design requirements here?

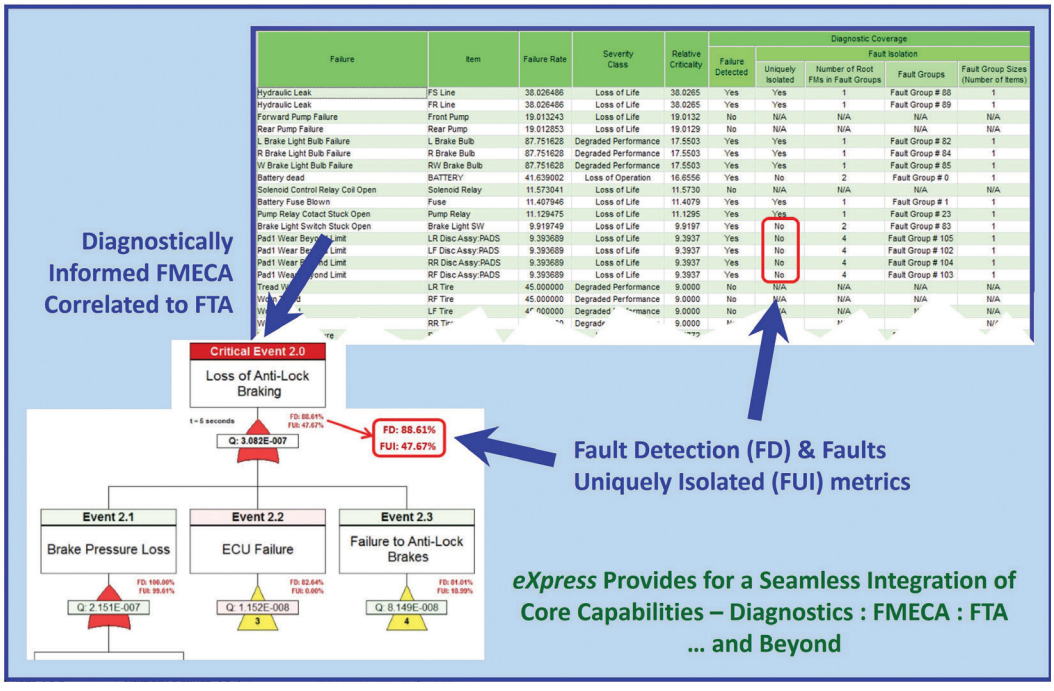
Wouldn't it be nice if...

1) Both the FMECA & FTA could instantly describe the diagnostic capability of the fielded asset (e.g. BIT, SHM, ATE, IETM, etc.) as constrained by the diagnostic design?

2) The FMECA seeded and corroborated with our Fault Tree Analysis, and **reduced the FTA development effort by 50 - 80%?**

Shouldn't the FMECA and FTA assessment products simply represent the likelihood of detecting the failure and the likelihood of "Uniquely Isolating" the cause(s) of the critical event in that branch of the FTA?

To learn more, visit *www.dsiintl.com*



Today, "Design for Sustainment" effectiveness is merely a choice.

Finding Those Hidden Diagnostic Requirements

For various reasons, many contracts and projects in recent years have been void of any reference to testability, diagnostics or health management. Some reasons as to why these type of requirements are left out may be that there is;

1. an assumption that the awarded contractor will interpret overall requirements and allocate accordingly
2. an incomplete understanding by the author(s) of the contract and Statement of Work (SOW) regarding the end-users needs or lifecycle cost impacts
3. a minimalist philosophy or approach to requirement development and flow down from the contracting office
4. a lack of oversight or review of requirements prior to releasing them to the contractor
5. a number of other reasons which may be driven by bureaucratic, cultural or organizational agendas. We will not address this within the context of this short article since the scope of these issues are too variable and difficult to contain.

Regardless of the reason(s), detailed diagnostic requirements frequently are left out. Although there may not be a specific (inherent) stated required for fault detection, fault isolation, built-in test, health status reporting, etc., this does not mean testability or diagnostic requirements do not exist. Rather, it warrants a thorough investigation of the contract & SOW to discover the hidden and elusive diagnostic design considerations that can have a significant impact to many other stated requirements (see the diagram below).

A common mindset / philosophy can be demonstrated by the statement: "I don't have any Testability or Diagnostic Requirements (Fault Detection or Fault Isolation Percentages) on my program, therefore, I don't need to do any assessments or analyses."

This statement is very likely not true and reveals a limited understanding of how, why and what diagnostic design and sustainment capabilities entail. Alternatively, one needs to peel the onion and delve into the programmatic details such as maintenance concept, logistics footprint, and test and integration requirements, as well as the overall sustainment and lifecycle costs.

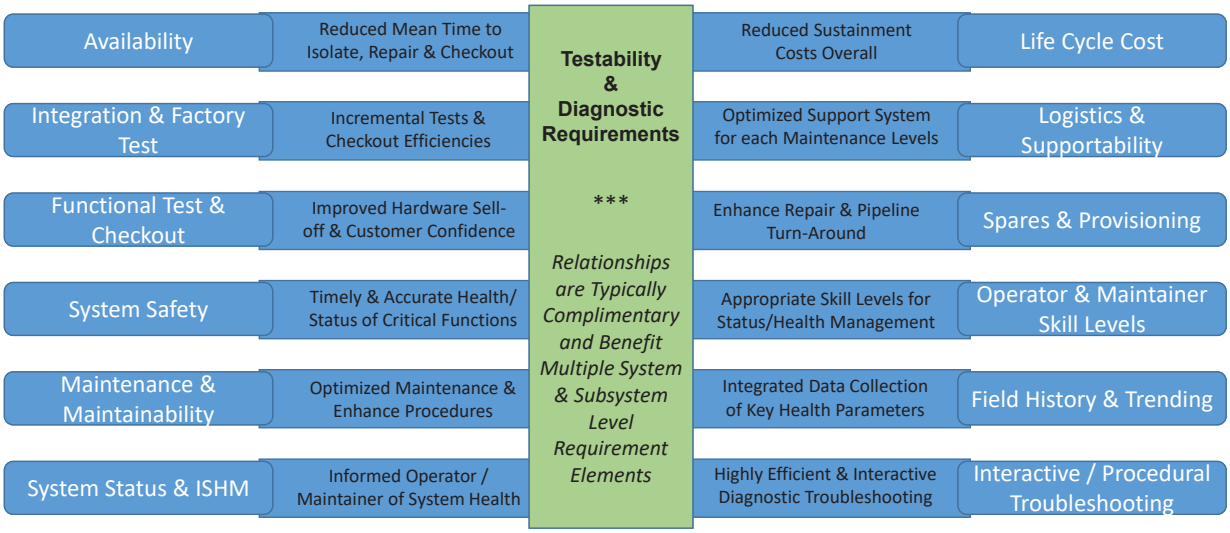
Program managers are frequently looking for ways to reduce cost and they don't want to spend money on a non-existent requirement. This is where some rigor is needed to investigate and build the case as to how up-front early diagnostic design investments will provide savings not only on the back-end of the design and development phase but also during test, production and more importantly system deployment to end-of-life...Thus overall sustainment.

Designers and teams sometime will take the approach that if we build it reliable enough, it won't fail and therefore we don't need to detect or isolate faults, we'll just add redundancy and use high-rel parts, etc. We know this is really bad logic. This approach will result in systems that have false alarms, large ambiguity groups and will drive maintenance times through the roof when a failure does occur not only because it cannot effectively be isolated in a reasonable timeframe but it also will result in many units being returned to factory or depots for repair when no repair is needed. These units are then classified as Re-Test-OKay (RTOK), No Fault Found (NFFs) or Can Not Duplicate (CND) which then have to be recertified and returned to inventory. This is typically a very costly process.

The reality is that many system requirements are directly tied-to and driven by testability and/or diagnostic design capability, function and thoroughness. The relationship between diagnostics and other system requirements must be considered early on in the program and sufficiently addressed in the design.

To learn more regarding how to examine these requirement relationships, visit the DSI publications page at:
www.dsiintl.com/support/publications/article-index/

Relationships Between Diagnostic and Other Key System Requirements



Optimized Diagnostic Design is the Foundation to Enable Overall System Requirement Compliance … Without it, the Risk of Non-Compliance is High

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Like us on Facebook, *Connect* with us on LinkedIN, *Follow* us on Twitter. In addition to the new DSI website, you'll now find DSI's presence on social media. Look for announcements of Software Releases and Upcoming Events. Feel free to add your comments! Or, if you'd like to share something more substantial, please feel invited to send it to us for review so we can share it with the entire DSI and Diagnostic Engineering Community.

AUTOTESTCON
September 11-14
Schaumburg, Illinois 2017

It is almost that time again for the industry leaders in the test & diagnostic world to come together. The event is AutoTestCon 2017 which will be held this year in Schaumburg, Illinois, near Chicago, on September 11-14. DSI will again offer unprecedented visibility at this year's AutoTestCon showcasing several new capabilities for the both the Diagnostic Design and Support Communities. We look forward to seeing you there! Stop by and visit us at booth 113.

Engineering Support Services - We Are Here to Help!

Do you know that DSI is much more than just a software developer? Yes, we are very proud of the analysis, simulation and run-time software tools we create to support our customers worldwide. However, DSI also has highly-skilled and talented Diagnostic Engineers who have years of experience in industry that are ready to help with the health management needs associated with your project(s). We can provide engineering support from concept and proposal phase to deployment and sustainment addressing all diagnostically related lifecycle elements. Here's a list of just a few of the areas we can help:

Start-Up - Proposal Support, Requirements Development, Definition and Allocation
Test Development - Embedded BIT, ATE Test Sets, On-Board / Off-Board Tests
Operational Diagnostics - Deployed Environments, Maintenance Concepts
Operational Trade Study Simulations - Critical Faults, Failures Over Time, MTTR
Modeling Support - Topology Creation, Modeling conventions, Hierarchy Structure
Diagnostic Validation - Desktop Fault Insertion, Maintenance / BIT Demo Support
Run-Time Interfacing - GUI / Non-GUI Environments, Workbench Integration
Optimizing Health Management - Test & Diagnostic Test Strategy Optimization, Sensor/Monitor Placement
Data Importing - Customize Data Exchange, Interoperable Tool Interfacing, Data Validation & Health
And Much More - Prognostics, Fault Tree Analysis (FTA), FMECA, Diagnostic Strategies & Sequences...

Contact DSI for more information

Training Course Schedule

Course Number	Pre-requisite	Course Description	Dates	Location	POC
ENTRY LEVEL TRAINING COURSES					
T-100		System Diagnostics Concepts and Applications	Oct 23, 2017	Orange, CA	info@dsiintl.com
T-110	T-100	Basic Modeling & Introduction to Testing	Oct 23 - 25, 2017	Orange, CA	info@dsiintl.com
T-120	T-110	Introduction to Testing & Analysis	Oct 25 - 27, 2017	Orange, CA	info@dsiintl.com
ADVANCED TRAINING COURSES					
T-200	T-120	Advanced Model Development and Analysis	Oct 16-17, 2017	Orange, CA	info@dsiintl.com
T-205	T-200	Advanced Test Development and Importing	Oct 18-20, 2017	Orange, CA	info@dsiintl.com
T-240	T-205	FMECA and FTA Development and Assessment	Nov 6-7, 2017	Orange, CA	info@dsiintl.com
T-250	T-205	STAGE Time-Based Assessments and Principles	Nov 8, 2017	Orange, CA	info@dsiintl.com
T-260	T-205	RTAT and DSI Workbench Theory and Application	Nov 9-10, 2017	Orange, CA	info@dsiintl.com

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