Diagnostic Data Detail Standardization Preparedness

A Prerequisite for Legitimizing Data Usage Targeting IEEE S5000F Sustainment Implementations

Proposed IEEE S5000F ILS Standard
As the IEEE continues to evolve the proposed S5000F ILS Standard, we anticipate that any data generated within DSI's ISDD tools can facilitate the relevant areas and forms as described in the proposed standard.

Dismissing the Benefit of being Diagnostically Proactive?
In viewing various applicable portions of the detail of the proposed IEEE S500F as it currently exists in the public domain, it is still unclear if any data structure is planned to be significantly robust to support the diagnostic engineering activities involved during the collaborative design development lifecycle for large, multi-organizationally Integrated Systems. To dismiss this proactive approach to designing for sustainment in the design development lifecycle can be an unfortunate lost opportunity to establish a collaborative approach to establishing the diagnostic integrity baseline for any complex system or equipment.

A collaborative set of standardized diagnostic data detail is a prerequisite for any legitimate attempt to serve as the precursor for standardizing on any "living" or ongoing Integrated approach to implementing advanced sustainment technologies or paradigms (as described in the Proposed S5000F).

Avoid Costly Rework Cycles
To this objective, we need to be able to "influence the design" for Fault Detection & Fault Isolation - a proactive design characteristic prior to sustainment feedback. "Test Coverage" at the integrated System(s)' level (in & about variant supplied designs, including COTS, MOTS, sensitive designs, multi-organizations, etc.) for complex systems needs to be worked so early so our LSA can work to evolving maintenance paradigms (taking advantage of new design, technologies & health management/sustainment tools, etc.) without cost prohibitive (re)work cycles.

Establish the Diagnostic Capability Baseline
We need to "know" the propagation of any failure causes that could possibly with the fidelity of the (BIT or "failed sensor-specified") reporting of any specific functional status. This WILL be experienced in fielded environment! This is an expected outcome when "integrated" system level Failure Effects are produced from the combining of lower-level subsystem designs' Failure Effects. This can be easily observed from the combining of any additionally, BIT-retrieved functional status of any interdependent components and their respective and pre-described Failure Modes.

To dismiss the opportunity to influence the design for establishing a collaborative diagnostic capability during design development will result in the diminished value to be gained from analyzing an assortment of collections of failure data from the field. Without a diagnostic integrity baseline, the failure data is independent and not vetted from a diagnostic design perspective. As such, we will be chasing failure data trends that may not be capable of ever realizing the diagnostic deficiencies in a complex integrated systems' design that give birth to diagnostic ambiguity. Data trend analyses will be an ongoing belated, tail-chasing and costly exercise. First Failures will not be prevented in a reactive approach to sustainment.

Diagnostic Certainty is a Proactive Opportunity

How accurate is the sensing & how do we "know" if the "sensors" are properly functioning? Do we have sensor corroboration in our integrated design? Too often, there are many other additional contributing diagnostic uncertainties inherent with "integrating" interdependent complex designs into fielded systems. This integration alone, compromises the imagined test coverage integrity – regardless if any interdependent design piece was believed to be vetted for sensor-to-BIT accuracy during design development. Test Coverage "interference" comes in many types – Do we account for all of these types of test coverage interference & how does our sustainment approach account for test coverage interference on a consistent, safe and "living" basis?

Defining and Tracking Test Coverage

"Test Coverage" is not typically known in complex systems using traditional BIT test analyses or methods. Too much of it is (unnecessarily) left to be discovered and learned from (sometimes costly) experience, which is a reactive approach that should only be applied for small "tweaking" diagnostics. As CBM becomes part of discussions, we need to know how to best "balance" prognostic "candidates" for our sustainment requirements & affordability profile. This "balancing" should be a simple output report from the integrated design – based upon mixing all sustainment approaches (preventative and corrective) and used with the LORA to know what "non-failed" components (FAULT GROUPS) will need to be replaced along with the "presumed-to-be, or going-to-be" failed components (as constrained by the current & evolving diagnostic integrity of our integrated system(s)) over the life-cycle of our system & its variants.

Minimize or Eliminate Diagnostic Ambiguity

Often BIT (on-board) tests are not repeatable in other operational states & such diagnostic information is compromised when commencing second tier diagnostics, which is to be supported by sustainment efforts – integrated to logistics or not – that end up in CND, RTOK and NFF due to ("Integrated" Systems') diagnostic weaknesses that only build over time. Replacing the same component (sometimes incorrectly) faster or repeatedly, does not improve mission success or Operational Availability.

Specifications and their respective control numbers are great and convey some agreed upon level of achievement ideals, but they need to be equally prevalent in both design the development (assessment) & the implemented sustainment solution(s). Such IEEE Standards as S5000F need to assume equal accountability tracing back to design assessment, else they simply become another contract funding "check box" that still leaves avoidable and costly "gaps" in the implementation of the diagnostics, as required to enable the most effective sustainment activity/ies at any point(s) in the life of the fielded integrated system(s).

Having an "Integrated" Logistics Sustainment paradigm that is most effective begins far earlier in the design development process than one has typically allowed themselves to fully understand. Need to allow "Design Influence" to truly mean, just that. Such is the starting point for serious ILS.

ISDD offers a Solution Model for S5000F

Lastly, and most importantly, the diagnostic integrity of any complex design can be ascertained – leveraged, and fully realized in the designs' operational implantation – at any point in the design's design development or sustainment lifecycle(s) when exercising DSI's ISDD (Integrated Systems Diagnostic Design) process.

Related Links:

IEEE S5000F Standard (proposed)

Overview of the ISDD Process