

IFDIS –Expanding Role within the DoD Maintenance Enterprise

Author Name(s): Ken Anderson
Company Name: Universal Synaptics Corp
Mailing Address: 4066 S. 1900 W. Suite B
Roy, UT. 84067
Phone: 801.731.8508
Email: Contact@USynaptics.com

Abstract:

There is a growing problem that continues to threaten the airworthiness, mission readiness, ownership cost and safety of aircraft. However, recent technical developments have made possible a new inspection method that greatly mitigates this threat, and now multiple case studies are validating the effectiveness of this new capability.

The growing problem is intermittent faults in new and aging aircraft electronic boxes. The recent development is the Intermittent Fault Detection & Isolation System™ (IFDIS™), and the case studies and expanding role within the Department of Defense maintenance enterprise that are validating the effectiveness of the IFDIS thus far involve the F-16, the F/A-18, and the EA-6B.

Maintenance personnel well know the challenge they face when the pilot reports that a system malfunctioned during flight, but the subsequent ground test of that system shows “No Fault Found” (NFF). It is apparent that there is an intermittent problem somewhere in the system, but the frustrated maintenance crew simply lacks the test equipment needed to enable them to detect and isolate the problem.

Repairing the intermittent circuit is seldom difficult; the difficult task is detecting and isolating which circuit within the box is intermittent. An intermittent fault, or momentary “open,” can be due to a number of different conditions including a cracked solder joint, a corroded contact, a sprung connector receptacle, a loose crimp connection, a hairline crack in a printed circuit trace, a loose wire wrap, a broken wire, or various other conditions. As the electronic boxes are pulled from the errant system for bench test, they often all test NFF. No repair is performed, because no problem can be detected.

Conventional test equipment is simply not designed to detect intermittent circuits. Rather, conventional equipment is designed to test the electronic box for nominal operation, and it usually “averages out,” and hence hides, any short-term anomalous events. The IFDIS was specifically designed to detect and isolate intermittent circuits in aircraft electronic box chassis. Hence, the IFDIS very effectively compliments conventional testers.

The conventional testers test for nominal equipment operation, while the IFDIS detects and isolates intermittent circuits. Because intermittent faults often only occur during the vibration and/or temperature extremes experienced in an operational environment, the IFDIS includes an environmental chamber and vibration platform that subjects the box to

simulated operational conditions, substantially enhancing the probability an intermittent circuit will manifest itself.

At the heart of the IFDIS is state of the art intermittent fault detection circuitry which continuously and simultaneously monitors every single electrical path in the chassis under test, while the box is exposed to the simulated operational environment. The intermittent fault detection analog neural network circuitry will detect when an intermittent event, even as short as 50 nanoseconds (0.00000005 seconds), occurs in any chassis circuit, and it identifies in which circuit the intermittent event occurred.

One IFDIS project alone has produced over a \$56 million dollar return (25 times ROI) while tripling the Mean Time Between Repair (MTBR). Previously undetectable problems are being rapidly identified and repair shop troubleshooting time is being substantially reduced. More importantly, the IFDIS is significantly enhancing aircraft reliability, aircraft availability, mission readiness and safety.