



NightHawk™ NFF Reduction Tool

Enhanced ATE Program Development Platform



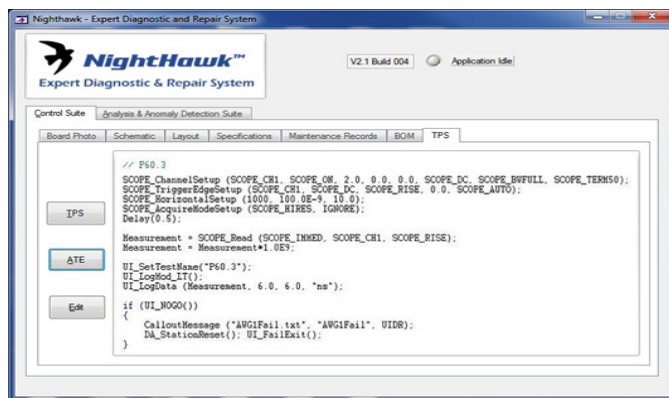
Features and Benefits

- Up to 60% reduction in No Fault Found (NFF) rates on identified Circuit Card Assemblies (CCAs).
- Algorithm-based Expert Troubleshooting Repair System tool designed to work with multiple systems, including VDATS.
- Up to 50% reduction in Mean-Time-to-Repair (MTTR) on CCAs.
- Produces test code that identifies hard-to-find 'soft faults'.
- Applicable to various ATE and commercial fleet MRO.

NightHawk

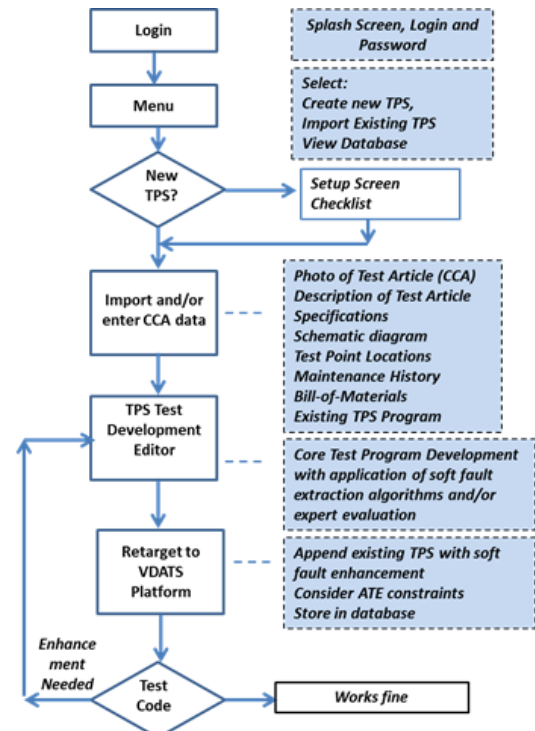
NightHawk ETRS is an interactive test development system that will reduce, or eliminate, NFFs on critical systems. This new application provides enhancements to test program set (TPS) code to detect soft faults on 'Bad Actor' Circuit Card Assemblies (CCAs) and other test articles, which remain difficult to isolate using conventional TPS methods. NightHawk offers the ability to minimize maintenance time by quickly identifying the root cause of difficult-to-find faults in CAAs and SRUs. This capability does not exist with conventional suppliers, making Ridgetop's approach at leveraging its background in advanced anomaly detection algorithms to be the leading choice in next generation NFF isolation and diagnosis.

Since conventional test program sets (TPS) are not considered adequate for all CCAs, many boards will test fine in the depot, yet fail when installed in the system. NightHawk is the next generation of new technology that is needed for the accurate testing of 'soft' fault test approaches. Using advanced anomaly detection algorithms, this software-based tool augments existing test programs with increased test coverage, saving maintenance costs and reducing repair time.



The NightHawk Interactive Interface

The NightHawk Top Level Flow



NightHawk Algorithms

The NightHawk Algorithm library was developed for use in TPS for detection of degraded failure modes. They include:

- **Frequency Response Analysis (FRA)**

Based in trigonometric function basis, the Fourier coefficients are computed for the data series using a forward algorithm which converts signal in time domain into frequency domain.

- **Wavelet Haar Transform (WHT)**

Computing the low pass and high pass filters and their structures to indicate abnormal behavior, our orthogonal coefficients are computed on a wavelet function system, based on the Haar system.

- **Autocorrelation Analysis (ACA)**

The correlation and regression function is computed between the original and shifted series with different values of the time delays.

- **Markov Chain**

Based on discrete time scales and the one-step transition probabilities between the different states, Markov chain algorithms enable each time period of the state of the object to be characterized by a probability vector, of which the components give the probabilities that the object is in a different state.

- **Auto Associative Kernel Regression (AAKR)**

This method can detect abnormal behavior of any system or component, assuming that the behavior is characterized by a vector of parameters -- some of which are obtained from sensors.

- **Critical Point Comparison (CPC)**

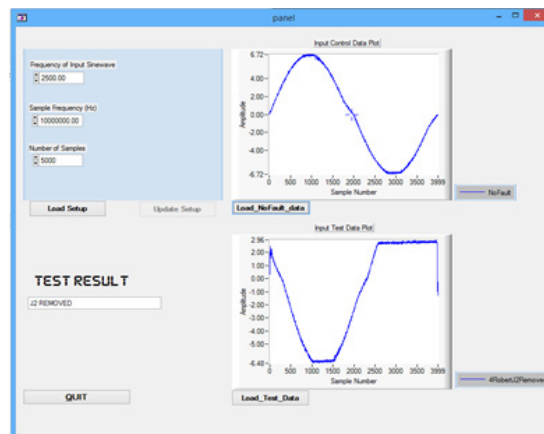
Developed to compare state space or frequency domain sequences, CPC is a graphical representation of the time series that can be imagined as a discrete representation of a continuous curve.

Industry Proven

By leveraging Ridgetop Group's expertise in advanced diagnostics and prognostics, NightHawk has already proven its adaptability through seamless integration with Test Platforms such as VDATS -- over 100 ATE Systems are installed at Air Force Logistics bases -- and is applicable to other agencies, ATE, and commercial fleet Maintenance Repair Overhaul (MRO) depots. In addition, many other commercial sectors, such as the industrial equipment and automotive sectors can benefit with NightHawk by being able to reliably identify and test for soft fault NFFs in large operating equipment.



High incidence of "Bounce Rate", No Fault Found (NFF) using conventional ATE approaches
Objective is to apply advanced anomaly detection to find latent defects or degradation in Printed Circuit Boards (PCBs) and to be offered as an option to other commercially available ATE software.



NightHawk Critical Point Comparison (CPC) panel with included test data

NightHawk NFF Applications

- Reduction of CCAs, SRUs and LRUs that recirculate due to inadequate test coverage.
- Higher operational readiness for aircraft, avionics, EW systems, and other critical systems.



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