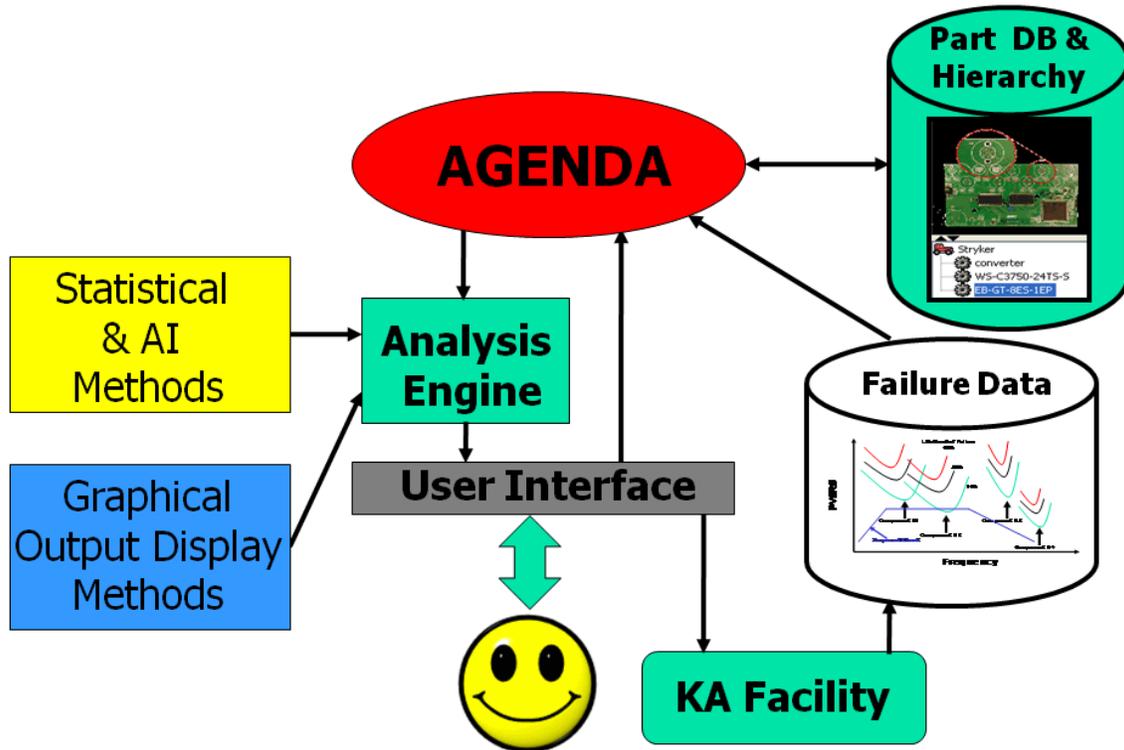


# ESET: Equipment Shock Expert Tool



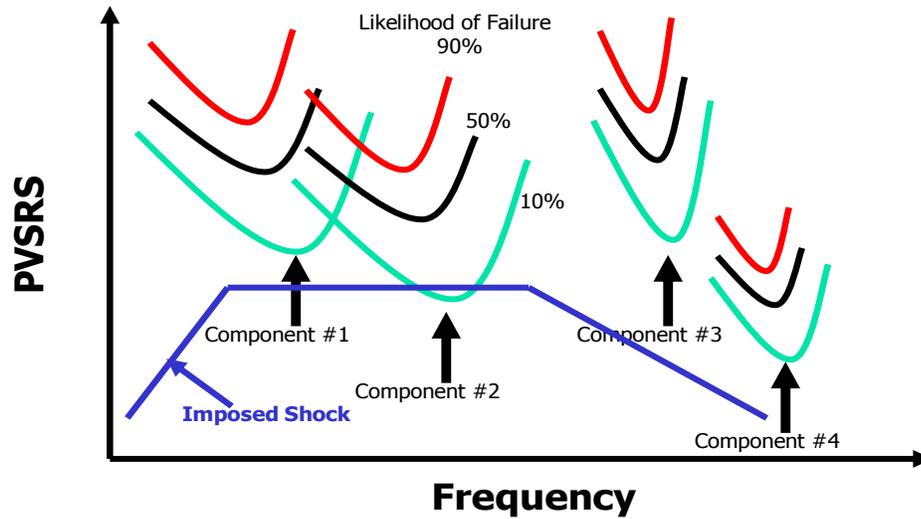
A critical problem facing the war fighter in Iraq and Afghanistan is that electronic equipment that is abruptly shaken from a nearby explosion may fail to operate even when there are no other damages or injuries. To assess the relative ruggedness of the sensitive equipment, an intelligent evaluation tool was needed to help in designing shock-resistant electronics and mounting systems.

The US Army Research Labs in Aberdeen Proving Grounds uses the GCAS Equipment Shock Expert Tool (ESET) to assess the fragility of electronic equipment subjected to blast shock waves from conventional weapons. The core of the ESET product is a Rule-based Production System for capturing expert knowledge, semi-empirical inferences obtained from shock testing and lesson-learned design rules.

Also included are:

- Knowledge Acquisition Facility is provided to allow new knowledge to be added in the future,
- Explanation Facility that produces a report describing how the system arrived at its conclusion,
- Advisory System giving suggestions for improving the design, and
- Data interface for exporting the results to MATLAB and MUVES.

The fragility of the equipment is presented as likelihood of failure profiles in terms of Shock Response Spectra parameters of Pseudo Velocity and Frequency as shown below. Each component found in the electronic equipment is represented by a series of failure profiles which are overlaid on top of the imposed shock profile. Individual components that fall inside the shock boundaries have a perceived likelihood of failure.



The system allows the user to represent the failure data at any logical level from a composite of all the electronics within the vehicle, to specific electronic boxes such as a radio, or to specific components within the box, such as a relay. Probabilistic methods are used to zoom-in to more detailed levels or out to more general levels.

Key to the success of the system is the content of the Knowledge Base which has been flexibly designed to grow over time as new knowledge becomes available. There is a general need in the Mechanical Engineering community for more shock failure data and a logical repository for maintaining this information. The ESET product provides the structure for such a repository and, using AI and Probabilistic methods, a powerful prediction engine for the response of electronics to shock events.