Pre-prototype modeling within 3C

When VT Miltope took on the challenge of creating a new generation of ultra-rugged military laptops, one of the first tools they jumped to was CFD. With a powerful Intel chipset, and full slate of MIL-STD-810F environmental requirements--including 60C ambient operating temperature and sealing from water, sand, and dust designing an effective cooling solution was a challenge.

The Rugged Laptop Computer (RLC) is used by the Army in portable configurations and mounted in military vehicles for strategic field applications. It features a dual heat-pipe-based Remote Heat Exchanger (RHE) and waterproof blower which are partially open to the environment while the rest of the circuit boards and components are sealed within the main chassis.

Using Coolit engineers showed that the blower and RHE, like personal body guards, usher heat away from the 35W CPU and 13W GMCH chips, keeping die temperatures well within specifications. Coolit also showed that the memory modules were adequately cooled by using integral heat spreaders that conduct heat into an access door in the magnesium chassis.

Heat pipes, RHE fins and detailed flip-chip FCBGAs were created easily for the CPU and GMCH chips based on manufacturer's parameters. The blower's impedance curve was entered along with inlet and exhaust filter foam characteristics, and all the other chassis details were rapidly created using readily available Coolit objects and models of components, such as heat pipes, chips, and fans.

VT Miltope performed Coolit modeling early in the design stages when it was not possible to build prototypes because real hardware such as circuit boards, RHE, and chassis components were not yet available. Much later, when real hardware was assembled, the component temperatures were measured with thermocouples under various intensive application heat loads. Measured values proved to be within a maximum of 3C of those predicted by Coolit.