Military demands shape rugged storage trends

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Military and Aerospace storage applications require the utmost in reliability and performance and are setting the standard for the storage industry

The success of network-centric operations relies on the ability to provide the right information to the right people at the right time. As a result, the issue of data storage is becoming increasingly important as the warfighter needs fast, reliable access to vast amounts of mission-critical data. Responding to the military's requirements for storage solutions that can operate in the extreme temperature climates faced by an unmanned aerial vehicle (UAV) or the intense shock and vibration of a tank or helicopter, electronics manufacturers are innovating memory storage and interface technology to meet the rigors of battlefield environments.

Aircraft systems, such as this Predator UAV, rely on rugged storage solutions that can withstand extremes in temperature, shock and vibration.

Military looks to solid-state storage devices

Now ubiquitous in consumer smart phones and MP3 players, solid-state Flash devices (or SSDs) have also proven indispensable to the military and aerospace

electronics market. The largest reason for the prevalence of SSDs in the defense market is their high reliability compared to traditional rotating hard disk drives. Unlike its old-style counterpart, SSDs have no moving parts and can tolerate rugged environmental conditions involving vibration, shock and temperature variations– making them ideal choices for deployment in tactical military applications.

Unbound by traditional mechanical constraints, SSDs can access data on demand at speeds 10x to 100x faster than spinning hard disks—considerably reducing or eliminating lag associated with loading files, opening programs or booting the system. SSDs are also more energy efficient than hard drives, performing about 1,000 operations per watt, compared with five operations per watt for disk drives.

With all the technical advantages of SSDs comes an economic cost, and this premium has slowed the adoption of SSDs in some arenas. However, thanks to the rapid commercial development of SSD technology, prices for Flash technology are dropping dramatically and the storage capacities are increasing each quarter – putting this storage option within the financial grasp of more and more military and aerospace programs. These higher available storage capacities have also been beneficial when deploying newer Windows operating systems, which tend to require more disk space to operate than their Linux counterparts.

Removable storage desirable for many military operations
Removable storage options are another growing trend in the military and aerospace market. A removable SSD media slot eases secure data transfer, declassification, servicing, system software updates or storage capacity upgrades. Military customers are increasingly requesting storage devices with removable options for increased security and mission flexibility. Historically, this is done using CompactFlash or similar removable small form factor Flash cards, provided that data storage capacities meet the application requirement.

SATA proves ideal for military requirements
As military systems continue to rely more and more on compute- and data-intensive software, the interface to memory and storage subsystems can’t risk becoming a bottleneck. As a result, Serial ATA (SATA) is becoming the de facto interface technology for new storage subsystem designs and the evolutionary replacement for the Parallel ATA (PATA)/IDE storage interface. A serial interface that can operate at speeds up to 6Gb/s, SATA is scalable and enables easy integration, high performance, and efficient system design – all necessary features for rugged computing design. Since its introduction in 2001, SATA technology has penetrated 99% of the PC market and evolved to provide options for a number of applications beyond traditional hard disk storage.

Not surprisingly, CompactFlash has also evolved with a SATA-based derivative known as CFAST, which maintains the same traditional size, but provides a higher maximum transfer rate than current CompactFlash cards (up to 600 Mbyte/s versus 133 Mbyte/s).
While not as large as 2.5” SSDs, the storage capacities for industrial CompactFlash and CFAST recently increased to as much as 128 GB.

SATA is becoming the preferred interface technology for new storage subsystem designs for a bevy of military vehicles.

Today's storage options meet military needs

Recent innovations in storage, like many electronic devices, are being dictated by military requirements. By requesting storage solutions that can deliver performance and capacity requirements in applications that would stress most storage products to their breaking point, the military has set the bar for storage devices very high. Fortunately, as demonstrated by the storage products available today, the electronics community has delivered.

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