

Embedded Systems in Aerospace and Defence Applications

Aerospace and defence has always been at the forefront of technological excellence and many spin off technologies have resulted. In fact over \$5.2bn worth over the years. Structures, engines, mechanics and all have a vital role to play in these great industries. However arguably its electronics that makes the magic happen.

Technology has moved at a phenomenal pace over the last 20 years especially in A&D. think civil aircraft inflight entertainment systems. Audio Visual on Demand (AVOD) is now common place on long-haul airline fleets around the globe with touch screens. Even aircraft lavatories are becoming automated with touchless flush buttons. As for the military we will never truly know or understand the level of detail that embedded systems are present in these complex systems so we have to look at what the market currently offers.

Still after 20 years of service PCMCIA, ATA Flash and SRAM cards, which are legacy memory tech, are still in operation with plethora airlines. Why? They have far fewer components, are robust and draw little power. At the time these cards for the only ones available on the market suited to the aircrafts requirements, be it Flight Data recorders, flight deck or avionics. 10 years ago there were around 50 manufacturers for these cards, today there are less than 5 as there is a shrinking market. Or is there? Until aircraft and helicopters are retired or scrapped airline fleets and helicopter operators upgrade to newer aircraft there will still be a demand for these cards. Upgrading flight decks in fixed and rotary wing aircraft is a costly and time consuming job. The more the aircraft is on the ground the less it is earning and with margins tight especially for airlines they can ill afford to be unnecessarily grounded. Its only recently we heard that the American B52 bomber will continue flying. That will be nearly 100 years of service which seems incredible but it comes down to the points made earlier. Structure engines, mechanical and electrics all will have had to go through strategic upgrades and maintenance at some point.

Looking at even older technology 3.5" floppy disks in particular there is still a healthy demand but getting hold of them is a different matter. Why are these still around? They don't break, they work every time and there is a miniscule change of a cyber-attack as the memory is not sufficient enough to host a bug. And for that reason the US Air Force still use these for their nuclear missile silos. Tried and tested works.

On the other end of the scale and turning our attention to the latest technology we seeing some incredible advancements in NAND Flash which if according to manufacturers and early reports, will be the staple of memory for years to come. But what about capacity? Only 11 years ago we saw 128MB micro SD cards, now 128GB is the norm. How long before 1GB micro SD cards are in the market, another 5 years perhaps?

Of course there are different grades and specifications of memory and storage, the Commercial of the Shelf (COTS) that you can buy in any good high street or web store to the premium end of the market - the industrial grade. IT is here the aerospace and defence industries where industrial grade memory and storage sits. There is a requirement to store large amounts of data; securely, in harsh temperature environments ranging from -40°C to 85°C often for long periods of time. The difference is often underneath the casing (although rugged metal casing is not un common) and the difference can vary drastically depending on the manufacturer.

Power protection, SMART Monitoring, AES 256bit encryption, conformal coating, hardware and firmware alterations and more importantly NAND FLASH all vary differently as do the capacities of storage devices. The holy grail of achieving 1TB storage in an industrial grade SSD has been achieved by many who are now starting to push the boundaries even further by introducing 2TB and in some cases 4TB. Interestingly a Korean company, Novachips is slowly introducing an 8TB SSD which is primarily for the military market. Early indications from a selection of clients show that the SSD has 'ground breaking performance'. So just how good is it? For the military key characteristics of any type of storage technology should have;

- 2.5" 7mm height
- MIL-STD-810F/G compliant
- Military Secure Erase protocol supported
- 256-BIT AES Encryption, Secure Erase and Write protect supported
- Adaptive thermal control
- Fixed BOM (Controller, NAND and Firmware)
- Constant write performance.
- On-board Capacitor Sudden Power off Protection,
- End-to-End data protection
- Ultra-rugged robust metal casing
- Wide operating temperature -40°C to 85°C
- 3 year warranty or maximum endurance used
- 8TB capacity