



# Flying ... off the shelf

In meeting the challenge of lower cost, the mil-aero industry is increasingly using commercial off the shelf (COTS) technologies to leverage the investments and innovations made by technology companies working in other industry sectors. By reducing risk, providing reliable systems and meeting commitments, the mil-aero COTS initiative is based on the premise that defence programmes will benefit from new technology and economies of scale if they can adapt to commercially available components, boards and systems.

While this COTS approach has been successful, there is room for improvement and commercial vendors must do a better job of meeting the challenging needs of the military and aerospace market.

During the 1960s, the mil-aero industry used commercial products, but soon realised that reliability, quality levels and product lifecycles were unacceptable for the harsh environments in which these

Can the mil-aero industry ensure COTS technologies meet safety and reliability requirements?

By **Mike Richardson.**

devices regularly operated. This saw the introduction of mil-grade products – more expensive and usually a couple of generations behind commercial technology. So the military started looking for ways to find a competitive advantage by using the latest technology products.

When the Perry Directive appeared in the mid 1990s, the idea was to have mil-aero OEMs pick up on the best commercial practices, obtain the highest quality for money spent and create better systems with a lower overall cost. Customers could then buy parts 'off the shelf' which would be suitable for future aircraft. After all, why

use old and expensive components when you can use commercial products?

"But by early 2000, mil-aero OEMs realised these commercial products only lasted a maximum of three years whereas what they were really looking for was ten," explained Altera's senior marketing manager, Amr El-Ashmawi.

## Beyond the call of duty

Altera realised it needed to offer the market commercial products that went further than commercial grade for COTS. As a result, it developed an 'Enhanced COTS' offering, which goes beyond what mil-aero expects, but without the penalty of higher cost and older technology.

"Enhanced COTS is about taking commercial products and extending them for mil-aero requirements," El-Ashmawi added. "They're more 'end of life' (EOL) friendly whilst operating at the demanding military operating temperatures without the additional costs

Illustration: Henning Löhlein





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and using the latest technology."

Mil-aero grade components are designed to be around for a long time and it's been suggested that many of the Boeing B52s in service are now flown by the grandsons of the original pilots.

GE Aviation's vp, advanced marketing and technology, Dr Gerry Vossler notes that everyone is familiar with stories about aerospace and military technology trailing the commercial marketplace. "Commercial laptops and gps receivers were used during the Iraq conflict, whereas some of the avionics equipment used was older than the average crew member," he claimed. "The armed forces could use the latest COTS technology and adapt it to meet their needs far easier than they could have integrated the technology into the systems available on their vehicles. Clearly, the complexity and cost of integrating innovative technologies into aerospace applications is high."

Dr Vossler suggests that, whilst the Mil-aero industry lacks the volume, there are few reasons why it should not pursue similar timeframes. "Leading aerospace companies have the same chip and board design skills as the likes of Apple, so what is holding us back from capitalising on the

promise of all this innovation potential?"

Mil-aero programmes demand faster iPod/mobile phone/pda speed and processing power, but they want it to work in rugged environments. Importantly, they also want the items to be supportable for up to 40 years, which then brings up the issue of spares for what is essentially a 'throwaway' commodity. Driven by these desires, COTS vendors need to ensure they satisfy the challenging needs of the mil-aero market.

"Those that have decided to focus on niche mil-aero markets do a reasonable job in meeting the challenges, whereas mainstream COTS vendors largely do not," stated IGG Component Technology's aerospace and defence manager Lloyd Francis.

"Quite simply, this is due to commercial pressures. High reliability component applications represent less than 0.5% of the electronics market, compared with 9% in 1984, so COTS vendors do not see significant return for servicing the high reliability market. This means the mil-aero market has to rely on niche suppliers."

Francis points out that if a COTS component is selected and screened carefully enough, then the reliability is known and it is either acceptable for end use or not.



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**IGG Component Technology**

"The problem is the subsequent use of COTS components from a different date code, lot or batch. COTS component manufacturers largely use offshore facilities, which are not always fully controlled by them. So there is a need to screen each batch of components, initially to ensure they are identical to the first batch. If this is found not to be the case, then COTS components have to be screened to the original criteria."

In this way, components that are suitable to meet safety and certification requirements can be identified, but these screening techniques and regimes need to be targeted at both the COTS components' likely failure mode – which only comes from experience – and the environment in which they will be implemented.

El-Ashmawi agrees: "Apple iPod style components will fail at 50,000ft, so we have to add a sensitivity to these types of requirements where you can protect against atmospheric effects. Many of these products go through shock and vibration, so a friendly EOL is vital. The trend used to be 4 to 6 years before manufacturers could roll out a new system; now, we are starting to see development cycles of 12 to 18 months."

To reduce COTS component time and R&D cost, Francis says that, in an ideal world, there would be an approved parts database from which design engineers could select components, with designers and component engineers working together update this database continually.

"This would allow consumer innovations to make it into the aerospace market quickly," he claims. "But we don't live in an ideal world and most aerospace OEMs have reduced their component engineering capability. Consequently, design engineers underestimate cost and time pressure and tend to favour more tried and tested technologies, rather than run risks with using the latest innovations."

The last word goes to Dr Vossler: "The challenge for aerospace companies is to incorporate technology innovations as they become available," he concluded. "However, they must do this whilst meeting or exceeding safety and certification requirements." 