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The Challenges of Pb-free Electronics Technology to the Aerospace and Defense (A&D) Industries: *"Beyond the Solder Joint"*

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ABSTRACT

The Aerospace and Defense (A&D) industry is becoming increasingly more engaged with Pb-free soldering technology. The primary driver in the development and fielding of A&D electronic products is *reliability* over *long service lifetimes*. Cost and time-to-market follow closely behind reliability. The A&D community has become engaged directly in Pb-free technology through the reliability issues arising from tin (Sn) whiskers that can potentially grow from the 100Sn finish on commercial off-the-shelf (COTS) and MIL-COTS components. Although Pb-free interconnections are not on the immediate horizon, if the rapid conversion to Sn finishes on components is any indication of how quickly the electronics industry advances materials technologies, that "horizon" is not too far in the distance. The reliability and service lifetime requirements of A&D electronics can be addressed from two general avenues. First, there are the purely technical aspects of Pb-free technology: the printed circuit board materials, surface finishes, and solder joint fatigue to name a few. Secondly, and just as important, there are the needs to manage the supply chain that supports the design and manufacturing of the hardware, as well as the need to manage the service lifetime-to-retirement leg of that hardware; that is, product "sustainment". Product sustainment is becoming an increasingly more important facet of A&D electronics, in general, and will be increasingly so, in the implementation of Pb-free technology. The A&D electronics sub-systems and systems are becoming more complex and expensive, thereby requiring longer service lifetimes – now, 20 to 40 years – in order for the manufacturer and the US Government (you and I …) to realize a return on the investment. Thus, sustainment will become a key responsibility of *both* the supplier of, and customer for, that hardware, which presents some unique challenges, both technical and logistical.

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