Micro Electrical Mechanical Systems Safe and Arm (MEMS S&A) Component Manufacturing Improvements

OBJECTIVE/SOLUTION:
The objective of this effort is to bring innovative metal MEMS S&A technology to manufacturing readiness by eliminating touch labor/rework, establishing second sources for component parts, enabling optimized tolerances and reducing process variation to produce highly reliable devices. The development of high-volume, cost-effective manufacturing processes for MEMS scale components allows automated inspection and assembly to bring this disruptive technology to fruition in the fuzing market.

Achievements:
• New initiator boards have reduced lead time from 3 months to 3 weeks, and cost by an order of magnitude.
• Modeling and testing of explosive interfaces confirm critical processing steps and result in a design modification that facilitates explosive ink loading.
• Comprehensive margin study of the micro-scale fire train (MSF) conducted to optimize tolerances, designs, and processes.
• Frame/Diaphragm/Base components integrated into a single unit using both polymeric injection molding and die casting fabrication methods.
• UV LIGA replaces X-ray LIGA for SAM fabrication reducing both lead time and cost of complex MEMS mechanism.
• Ballistic testing of all ManTech initiatives demonstrates proper arming, detonation transfer, and viability of new components.
• Improved manufacturing readiness levels from MRL4 to MRL7

Benefits:
• High volume, cost-effective manufacturing processes for MEMS scale components
• Automated inspection and assembly to produce highly reliable metal MEMS S&A assemblies

Benefits (cont):
• Smaller S&A size and weight allows added capability or payload at system level
• Current focus is advanced medium caliber munition systems, including Increased Range Anti-Personnel (IRAP), which is a 40mm grenade capable of defeating targets in defilade.
• Additional transition opportunities include Cluster Munition Replacement Technologies (CMRT) and Lightweight 30mm for Apache.
• Replaces vendor unique processes with industry standard processes to develop high-volume, cost-effective manufacturing
• Reduces cost and lead times for key components, including initiator board, frame and Setback-Arm Mechanism (SAM).
• UV-LIGA advancements enable SAM manufacturing options and an integrated base/frame component (reducing part count).

Transition and Weapon Systems/Secondary Items Impacted:
• Increased Range Anti-Personnel Cluster Munition Replacement
• 40mm Grenade

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