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

Objective

The objective of this effort is to bring innovative metal MEMS S&A technology to manufacturing readiness by eliminating touch labor/repair, 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.

How It's Accomplished

- Replace vendor unique processes with industry standard processes to develop high-volume, cost-effective manufacturing processes for MEMS scale components allowing automated inspection and assembly to produce highly reliable metal MEMS S&A components.
- Reduce cost and lead times for key components. Initial emphasis is on initiator board and frame components.
- Comprehensive margin study of the micro-scale fire train (MSF) to optimize tolerances, designs, and processes.
- Results of MSF modeling and experimentation inform frame manufacturing process trade study.
- Ballistic verification testing to ensure processes provide fully functional safe and arm devices.

Achievements

- Modeling of micro-scale fire (MSF) provides insight into explosive loading, frame/base interface, and material selection for manufacturing process trade studies.
- Evaluating alternatives to thin-film bridge initiator technology. Both wire bond resistors and embedded resistors created in required form factor. Detonation propagated from spot charge to initiation charge.

Benefits

- High volume, cost-effective manufacturing processes for MEMS scale components.
- Automated inspection and assembly to produce highly reliable metal MEMS S&A assemblies.
- Smaller S&A size and weight allows added capability or payload at system level.
- Current focus is advanced medium caliber munition systems, such as Small Arms Grenade munition, which is a 40mm grenade capable of defeating targets in defilade.

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