

Designed, developed and built automated process to properly install confidence clips onto M228 practice hand grenade fuses.

Process improves warfighter safety, eliminates potential for accidental deployment of hand grenades



M228 practice fuse



Confidence Clip



M228 practice hand grenade with Confidence Clip



Semi-automated Machine

PROBLEM

Soldiers were taping the safety pull ring against the body of the M67 fragmentation hand grenade to ensure the safety pin was not accidentally deployed, causing severe injury or possible death. Reports regarding this practice have dated as far back as World War II.

OBJECTIVE

To design and develop a new automated process to install the government-approved confidence clips to the existing 15 million M228 practice hand grenade fuses in inventory and to ensure proper implementation and soldier training on the confidence clips. This would eliminate the need for the warfighter to tape the safety pull ring to the body of the hand grenade and avoid accidental and catastrophic deployment of the M67 fragmentation hand grenade.

TECHNICAL APPROACH

The National Center for Defense Manufacturing and Machining (NCDMM) assisted Blue Grass Army Depot (BGAD), and the Armament Research, Development and Engineering Center (ARDEC) on the design and development of the new process, and teamed up with automation fabricator, Kinemetrix in Lexington, KY, to design, develop, and build two automation systems capable of assembling, inspecting, and testing confidence clips on the 15 million inventory of M228 practice hand grenade fuses. Kinemetrix engineered key technologies including two fully automated confidence clip assembly systems, robots, custom grippers, vision systems, and position sensors, and programmable software with real time statistical data.

This project aligns to:



Advanced Manufacturing

PROJECT END DATE

December 2013

Accelerating innovative technologies, processes, and materials through applied research and development.

SUCCESS STORY

ACCOMPLISHMENTS

- Improved warfighter safety.
- Eliminated accidental (catastrophic) deployment of the M67 fragmentation hand grenade.
- Eliminated the need for the warfighter to tape the safety pull pin ring to the body of the grenade, ultimately providing the soldier with a level of confidence that the safety pin cannot be removed until intended.
- Four specific phases of project were planned and completed.
 - Phase I – Initial Discussions and SOO Review
 - Phase II – Complete and Present Final Conceptual Design to BGAD and ARDEC
 - Phase III – Design/Build/Ship/Install Two Semi-Automated Machines
 - Phase IV – Additional Package Selections to Enhance the Current Machines
- Cost avoidance of \$14.9M over 7 years for 15 million fuse assemblies.
- Two M228 confidence clip semi-automated machines built and installed at BGAD.
- Trained BGAD personnel on system operation, robot programming, Insight vision hardware, and maintenance, as well as data collection and analysis software.
- Obtained safety approval for use of machinery on live M228 fuses.

FUNDING

\$4.15M total project budget

PROJECT PARTICIPANTS

Project Principal:

National Center for Defense Manufacturing and Machining (NCDMM)

Other Project Participants:

Armament Research, Development and Engineering Center (ARDEC)
Blue Grass Army Depot (BGAD)
Kinemetrix

Public Participants:

U.S. Department of Defense

About NCDMM

NCDMM delivers innovative and collaborative manufacturing solutions that enhance our nation's workforce and economic competitiveness. NCDMM has extensive knowledge and depth in manufacturing areas—both commercial and defense—continually innovate, improve, and advance manufacturing technologies and methodologies. Our experienced team specializes in identifying the needs, players, technologies, and processes to attain optimal solutions for our customers. We connect the dots. That's the NCDMM methodology. NCDMM also manages America Makes and the V4 Institute and is the cornerstone of the Manufacturing Technology Deployment Group, Inc. (MTDG). To learn more, visit ncdmm.org.