

GENERAL DYNAMICS

Armament and Technical Products

M2E2 Barrel Extension Enhancements

Dave Stouffer

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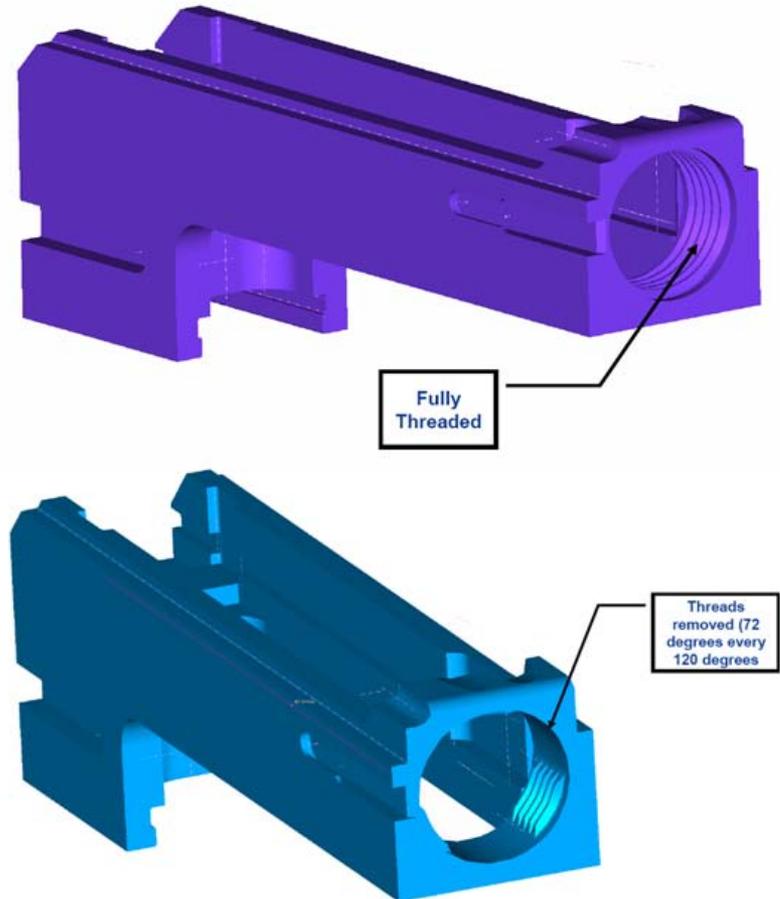
History/Background

- Mid 1990's
 - GDATP developed a Quick Change Barrel (QCB) kit capable of converting the standard M2HB weapon to QCB configuration with fixed headspace & timing.
- 2006
 - Six QCB weapons were evaluated by the US Army at Aberdeen Proving Grounds.
 - Endurance testing not completed due to development of fatigue cracks in all six alloy steel barrel extensions.
- Failures occurred consistently in the same area, and were considered to be fatigue related.



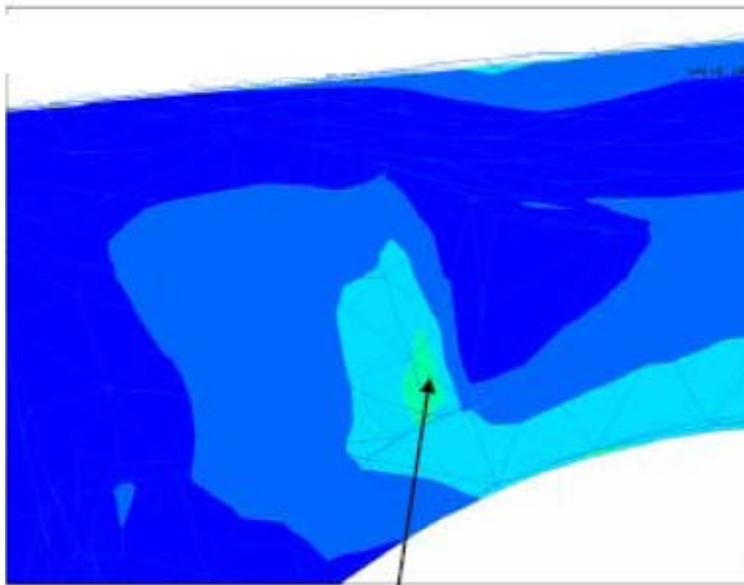
FEA Analysis

- Initially theorized that the interruption of the threads/reduction of threaded area significantly weakened the QCB configuration
- Conducted a Finite Element Analysis comparison of the standard M2HB Barrel Extension and QCB Barrel Extension to further investigate this theory.
- Generated FEA Models
 - Standard HB Barrel Extension (fully threaded)
 - QCB Barrel Extension (interrupted thread)
- Conducted Instrumented load tests to correlate model strains with test strains.
- Found the peak stress in the area of interest to be ~ 35% higher in the area of interest on the QCB version.



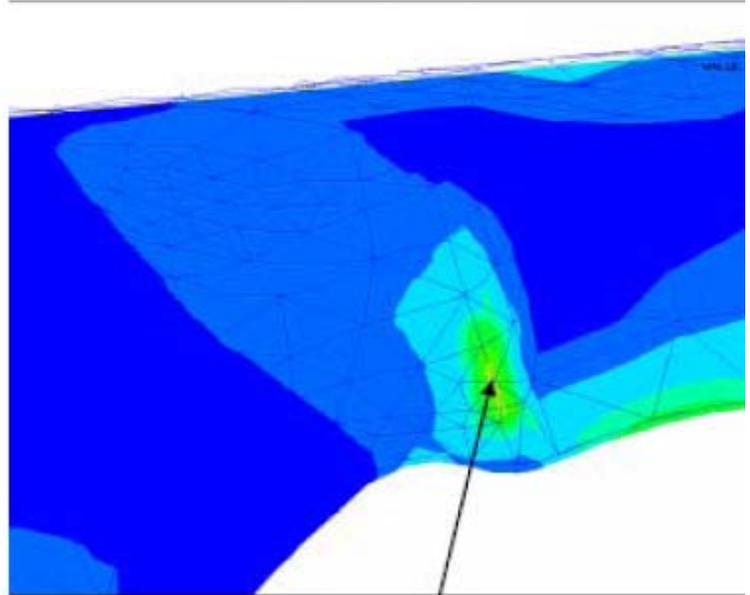
Stress Field Comparison

Fully Threaded



1.00

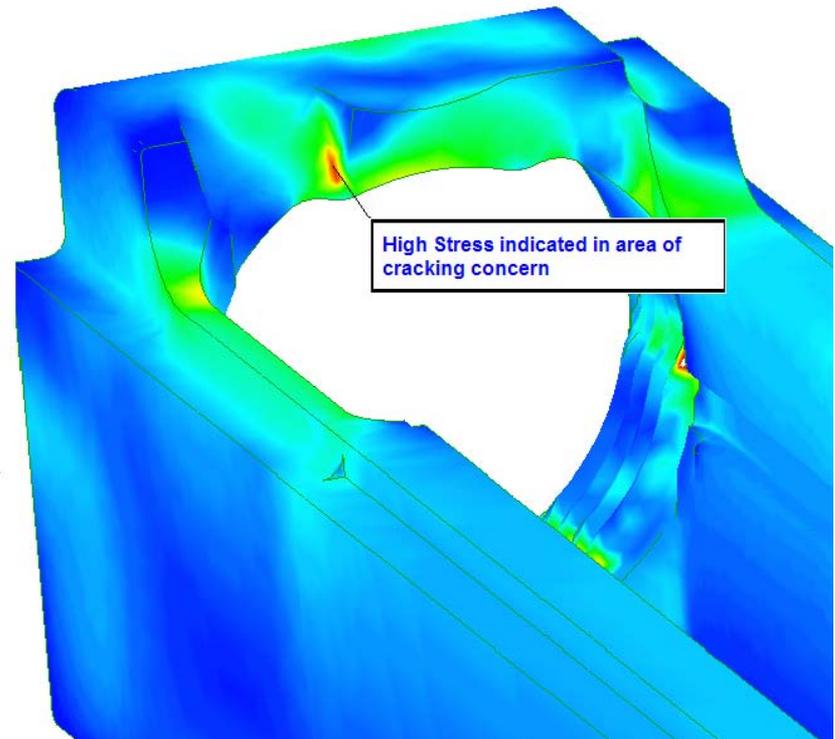
Partially Threaded



1.35

Redesign Effort

- IR&D Project executed to develop, implement and test a solution to the fatigue cracking problem.
- Project Requirements:
 - Minimize geometry changes to maintain commonality & interchangeability with standard M2HB Barrel
 - 30,000 firing cycles minimum life
 - Hot Operating Temperature (~800 deg F)
- Started with material studies, which led to Maraging Steel
- Benefits of Maraging Steel
 - Additional strength
 - Superior performance at extreme temperatures
 - Greater fracture toughness and reduced susceptibility to local fatigue cracking



Test & Evaluation

- 2007 IR&D Effort
 - Fabricated prototype QCB Barrel Extensions using Maraging steel and subjected to a 30,000 round fire test.
 - Conducted Magnetic Particle Inspection and Dye Penetrant inspections at 1K, 5K, 10K, 15K, 20K and 30K round intervals.
 - No discernable indications of fatigue cracks.
- 2008 Bid Sample Test & Evaluation
 - Maraging steel barrel extensions were submitted as part of GDATP's M2A1 bid samples for competitive testing and evaluation.
 - Three bid sample weapons were each fired in excess of 33,000 rounds prior to barrel extension failure.
- Today
 - The durability of these components has generated interest in transitioning from alloy steel to maraging steel for standard M2HB barrel extension production.

M2E2 Kit Components



- Flash hider
- Quick Change Barrel
- Barrel Support
- Barrel Extension
- Solid Breech Lock

Benefits to the Soldier

- Increased safety margin
- Reduction in damaged weapons
- Increased weapon Operation Readiness
- Reduced logistics burden

Questions?



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