

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA242

Transition Target: Aircraft Gun Systems; M197 rotary cannon

Other Transition Opportunities: Greaseless guns, hard chrome replacement, pumping equipment, metals or alloy components, turbines, bearings.

Notes: Medium caliber aircraft guns like the M197 rotary cannon experience multiple points of friction and therefore need frequent preventative maintenance to address wear and corrosion (see accompanying picture).



U.S. Navy photo,
<https://www.defense.gov/Multimedia/Photos/igphoto/2001321866/>

WHAT

Operational Need and Improvement: Grease currently provides most of the wear and corrosion protection to the moving parts of gun systems. However, high wear parts must be regularly cleaned or replaced because the grease collects sand, dust, and carbon, increasing wear on the part. For example, the rotor tracks and breech bolt assembly on the M197 rotary cannon are cleaned, inspected, and repaired/replaced at regular maintenance intervals. An alternative to grease-based lubricants is needed to reduce these maintenance burdens and provide cost savings.

Specifications Required: The coating must be 5 um (0.2 mil) thick, prevent wear beyond current maintenance intervals at operational temperatures (200 F), and subsequently prevent corrosion for 168 hours of salt spray exposure per ASTM B117.

Technology Developed: Solid lubricant coatings are applied once and extend the lifetime of moving parts. TDA's two-part coating system combines active corrosion protection (demonstrated in ASTM B117 salt fog testing) with long-term durability and lubricity. Additionally, the coating is easy to apply by soaking and hand spraying, and does not require sophisticated and expensive equipment such as vapor deposition chambers.

Warfighter Value: This technology will reduce the maintenance burden, increase part lifetime. Specifically, it will reduce parts that must be frequently inspected and increase the time to inspection threshold of O-Level (post-fire) and I-Level maintenance. It will also result in cost savings by increasing the replacement interval of high-wear parts, reduce man-hours requirement for M197 Maintenance, and reduce cannon failures that occur before depot overhaul.

WHEN

Contract Number: N68335-21-C-0353

Ending on: Aug 09, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Coating prototype locked down	Low	Passes equivalent of 30,000 rounds on wear simulator	4	1st QTR FY23
Physical properties comparison	N/A	Comparative performance of experimental coating to current coating system, WRT corrosion (ASTM B117), adhesion (ASTM C1624), hardness, friction/wear	3	2nd QTR FY20
Dry cycle endurance test #1	Medium	Endures 15k simulated rounds and 168 h salt fog	5	4th QTR FY23
Dry cycle endurance test #2	Medium	Endures 30k simulated rounds and 168 h salt fog	6	4th QTR FY24

HOW

Projected Business Model: This coating would be commercialized via licensing of the coating formulation and application technologies to the prime contractors. Our solution is composed of a combination of proprietary and commercial, off-the-shelf products, and TDA has developed unique expertise in the formulation and application of the coating.

Company Objectives: We are interested in identifying a prime contractor that would apply this coating to medium-caliber guns during manufacture. This could either be a prime contractor specifically for the M197 gun, or another gun manufacturer that is interested in our coating solution.

Potential Commercial Applications: TDA's coating could be used to reduce wear and corrosion for a variety of applications. In particular, our solution is well suited to any environment in which a part would encounter abrasive/erosive conditions. Due to our unique application method, our coating is ideal for complicated parts and geometries. The coating could be applied to any metal surface for which a self-lubricating functionality is desired.