Department of the Navy SBIR/STTR Transition Program

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Enhanced Clamp Cushion

Hy-Tek Manufacturing Co. Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-265 (F/A-18 & EA-18G)

Transition Target: F/A-18 & EA-18G

TPOC:
443-534-5879

Other transition opportunities: U.S. Military, Foreign Military, U.S. and Foreign Military and Commercial Aircraft manufacturers i.e. Boeing, Lockheed Martin, Northrup Grumman, Gulfstream (General Dynamics), Airbus, Sikorsky, U.S. and foreign airlines and cargo carriers i.e. American Airlines, Delta airlines, United Airlines, Southwest Airlines, FedEx, UPS, etc.

WHAT

Operational Need and Improvement: Hydraulic, fuel, and electrical line clamp integrity is paramount to aircraft flight safety and mission success. In particular, clamp loop and cushion failure can result in line abrasion and fatigue that jeopardizes normal aircraft operation and therein crew safety. Currently deployed Navy aircraft clamp cushions are fabricated of a nitrile elastomer that is not well suited for prolonged resistance to chemical, UV, and ozone exposure. Additionally, these clamp loops and integrated cushions tend to form an ovular shape around cylindrical lines that causes unnecessary mechanical shear stress and abrasion at the cushion/line interface, which results in rapid strain related cushion damage and failure. Enhanced Clamp Cushion (ECC) solves these problems with the combination of a geometrically engineered clamp loop and flourosilicone cushion that greatly reduces mechanical shear stress and the frequency of strain related cushion damage. ECC cushion material possesses great resistance to deterioration during prolonged UV light, Ozone, and chemical exposure.

Specifications Required: Once an aircraft line clamp fails, the hydraulic or fuel tube is no longer adequately supported, which could result in two immediate problems: the hydraulic tube might break or the hydraulic tube might chaff or abrade against another tube or structure. Either scenario creates a detrimental effect for the aircraft and flight crew, further increasing cost and decreasing fleet readiness. The ECC must satisfy the performance requirements as specified in MIL-DTL-85052/1C and MIL-DTL-85052B.

Technology Developed: ECC is comprised of a geometrically and structurally engineered clamp core and cushion that, when integrated together, provide enhanced line fit, cushion shear stress reduction, and line stability. The ECC metal core and cushion are mechanically joined using "mohawk" structures that prevent the cushion and core from moving, shifting, or vibrating independently. This feature prevents the metal core from applying geometrically induced shear stress to the cushion and strain related cushion damage. Importantly, when assembled, the engineered metal core and cushion structure forms a matching concentric shape when installed on cylindrical aircraft lines. This concentricity significantly improves ECC line stabilization and diametral retention performance while reducing potential line abrasion and damage. When these features are combined with UV, ozone, and chemical resistance flourosilicone cushion material, ECC becomes a high performance, high longevity line clamp producing significant cost avoidance and a positive ROI for the U.S. Navy.

Warfighter Value: • Increases the Readiness, Reliability and Operational Availability of U.S. Navy Aircraft
• Enhances Navy Aircraft Mission Safety for U.S. Navy Flight Crews
• Reduces Logistical Burdens and Costs Associated with Aircraft Line Clamp Installation and Maintenance
• Reduces U.S. Navy's Aircraft Line Clamp Capital Costs and Life Cycle Cost

WHEN

Contract Number: N68335-20-C-0053 **Ending on:** October 14, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
ECC cushion material selection and performance validation	Low	Satisfy Navy Material performance specs	TRL 4	August 2021
ECC structural and geometry optimization and performance validation	Low	Satsify Navy ECC performance requirements through prorotype testing	TRL 5	January 2022
ECC Cushion Extrusion Mass Fabrication	Low	Satisfy all details of ECC fabrication drawings through dimensional analysis and testing	TRL 6	March 2022
ECC Performance testing on-board Navy Aircraft	Med	Satify Navy material and performance requirements through prorotype testing on Navy Aircraft	TRL 7	October 2022

HOW

Projected Business Model: HMC plans to use in-house manufacturing personnel and resources to manufacture deliver ECC and ECC variants to U.S. Navy and other military clients. HMC possesses experience in manufacturing parts and assemblies for commercial clients including Caterpiller and AGCO as well as military clients including U.S. Navy and U.S. Army. HMC currently manufactures the High Load Roller Bearing (HLRB) for U.S. Navy DDG helicopter bay doors under a NSN and has experience in marketing and selling its material and mechanical innovations across multiple sectors. HMC plans to begin full-scale ECC fabrication under a well-developed manufacturing plan after successful TRL 8 prototype performance and longevity validation on U.S. Navy aircraft. That plan will include inital low rate ECC production within 1-month after TRL 8 validation. HMC's analysis validates ECC as a cost effective, reliable, and high longevity alternative to currently deployed line clamps capable of generating substantial cost avoidance and positive ROI for U.S. Navy.

Company Objectives: HMC's objective for FST include technical discussions and Demonstration of the ECC technology to U.S. Navy and prime contractor stakeholders. These events will reinforce the great value that ECC technology brings to those stakeholders having unsatisfied aircraft line stabilization, line clamp longevity and line clamp cost requirements. HMC expects that FST will reveal addtional military and commercial capability gaps that can be filled through development and demonstration of application specific ECC variants. HMC will request that Navy provide introductions to prime contractors with these interests as well as help identify Navy programs having similar capability gaps.

Potential Commercial Applications: HMC's goal is to market and sell ECC fo use across all salient U.S. Navy, USMC, Army, and Coast Guard aircraft platforms including Combat aircraft, Trainer aircraft, Electronic Warfare aircraft, Tanker aircraft, Rescue aircraft and Helicopters. Commercial applications include ECC design variants for private, commerical, and cargo aircraft manufactured by Boeing, Airbus, Lockheed Martin, Sikorsy, Bell, Northrup Grumman and Gulfstream (General Dynamics). HMC expects DOD to be an important initial customer for mature ECC variants and provide performance validation and sales revenue with which HMC can pursue other commercial markets.

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