

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0389

Topic # N192-106

Rolling Door Seal (RDS)

Hy-Tek Manufacturing Co. Inc.

WHO

SYSCOM: NAVSEA

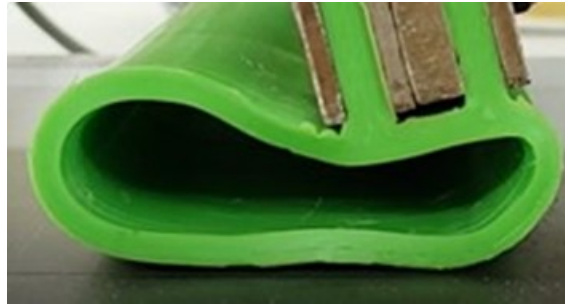
Sponsoring Program: PMS 400D, DDG 51 New Construction Program

Transition Target: DDG-51 FLT IIA/III Helicopter Hangar Doors.

TPOC:
215-897-1446

Other transition opportunities:

Various U.S. Navy marine vessel liquid seal applications as well as military and commercial systems requiring chemical resistance liquid sealing capabilities.



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WHAT

Operational Need and Improvement: HMC's Rolling Door Seal (RDS) provides Navy a departure from using "brute force" elastic deformation of a thermoplastic elastomer to form a liquid tight seal beneath the helicopter bay doors of DDG-51 Class Destroyers. RDS is comprised of a hollow elastomer boot having a geometry that allows it to roll into place beneath the helo-bay door to form a wide and reliable liquid seal without the application of unnecessary compressive or bending stresses. RDS boot structure eliminates the formation of large mechanical stresses and strain damage that occurs by acute angle deformation of the elastomer. RDS prototype testing has proven it capable of providing a reliable chemical and exposure resistance liquid seal for greater than 4800 helo-bay door cycles as well as satisfying all U.S. Navy material and performance specifications delineated in the original SBIR solicitation. These included enhanced chemical and fuel resistance, easy installation, enhanced helo-bay safety, logistics, and reduced seal replacement costs among others.

Specifications Required: • Excellent Resistance to Salt, Salt Water, Fuels such as JP-4 and JP-5, Lubricants, Hydraulic Fluids, Aqueous Film-Forming Foam (AFFF), UV Light, Chemicals and Solvents used by the U.S. Navy • Operating Temperatures: Minimum: -40°F; Maximum: 120°F • Minimum Service Life of 4800 Open/Close Cycles • Significant improvement in DDG-51 helo-bay safety logistics • Improve the operational availability of DDG-51 deployed helicopters • Significant reduction in the occurrence of seawater, fuel, or other liquid infiltration and subsequent DDG-51 component damage • Reduces Logistical Burdens Associated with DDG Helo-Bay Door Seal Installation and Maintenance • Reduces U.S. Navy's Seal Replacement Capital Costs

Technology Developed: RDS's engineered geometry practically eliminates the bending, compressive, and frictional stresses characteristic of current DDG Destroyer helo-bay door seal operation. These design features facilitate greater seal reliability and service longevity. RDS is comprised of a hollow chemical resistance elastomer boot with geometry that allows it to roll beneath the helo-bay door to form a wide and reliable liquid seal without application of excessive deformation or bending stress. Seal performance and longevity are facilitated by RDS' low material strain "roll-into-place" deformation during closure of the helo-bay door. HMC's performance analysis of mature prototypes validated that RDS facilitates an effective, repeatable, reliable, and liquid tight seal while eliminating bending and compressive stresses that cause rapid material strain failure.

Warfighter Value: RDS deployment will greatly increase DDG helo-bay door water seal performance and longevity. TRL 5 RDS prototypes have withstood protracted fuel and chemical exposure testing and 10,000 simulated door open/close cycles across artificially roughened surfaces without exhibiting

WHEN

Contract Number: N68335-21-C-0170 Ending on: January 20, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
RDS seal material selection	Low	Satisfy Navy Material performance specs	TRL 4	August 2021
RDS boot geometry optimization	Low	Satisfy Navy performance requirements through prototype testing	TRL 5	January 2022
RDS Extrusion Mass Fabrication	Low	Satisfy all details of RDS fabrication drawings through dimensional analysis and testing	TRL 6	January 2023
RDS Performance testing on-board DDG Destroyer helo-bay door	Med	Satisfy Navy material and performance requirements through prototype testing	TRL 7	January 2024

HOW

Projected Business Model: HMC plans to utilize its in-house manufacturing personnel and resources to directly manufacture, kit and deliver RDS and RDS variants to U.S. Navy and other clients. HMC possesses vast experience in manufacturing parts and assemblies for commercial clients including Caterpillar 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 vast experience in marketing and selling its material and mechanical innovations across multiple sectors for multiple applications. HMC plans to begin full-scale fabrication of RDS under a well-developed manufacturing plan soon after successful TRL 8 prototype performance and longevity validation testing on board a DDG destroyer. That plan will enable initial low rate RDS production within 1-month after TRL 8 validation. HMC's cost analysis validates RDS as a cost effective, reliable, and high longevity alternative to currently deployed DDG helo-bay door seals 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 RDS technology to U.S. Navy and prime contractor stakeholders. These events will reinforce the great value that RDS brings to those stakeholders having unsatisfied marine vessel liquid sealing requirements as well as other capability gaps that can be filled through development and demonstration of application specific RDS variants. HMC will request that Navy provide introductions to prime contractors with these interests as well as help identify other Navy programs will similar capability gaps.

Potential Commercial Applications: Commercial applications for RDS include among others: Liquid seal technology for the chemical manufacturing industry, Commercial cargo vessel liquid seals, Commercial yacht builders, amphibious military vessels, Residential and commercial door, bay, and window liquid seals for coastal and flood plain regions, Marine hub seals, liquid flow channel and conduit seals.

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