Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for Release. Distribution is unlimited.
NAVSEA #16-589

Topic # CBD02-201
Paragon Dive System (PDS)
Paragon Space Development Corporation

WHO

SYSCOM: NAVSEA

Sponsoring Program: Supervisor of Salvage and Diving (SUPSALV)

Transition Target: Mobile Diving and Salvage Units (MDSUs) and Underwater Construction Teams (UCTs)

TPOC:
(202)781-1683

Other transition opportunities: U.S. Army Corps of Engineers, Environmental Protection Agency (EPA) Environmental Response Team (ERT), Naval Medical Research Center (NCMR), State/City Government Diving Units, Seaport Authorities, & the Offshore Diving Community

Notes: Paragon's KM-37 helmet Mod Kit for exhalation and suit output to a return surface exhaust (RSE) regulated by a control valve is the only chemically-compatible retrofit kit with full environment isolation for Category 1 diving. Unique materials and valves/controls were characterized and developed. Two surface control panels and five suits/six helmets have been built.

WHAT

Operational Need and Improvement: Water conditions have become increasingly more dangerous to both military and commercial divers due to biological, toxic industrial chemical/toxic industrial material (TIC/TIM) and potential chemical warfare agent (CWA) contamination. Additionally, with stringent regulations governing personnel exposures, the need exists for an improved surface supplied diver worn system to prevent the exposure of the working diver to these contaminated environments while fulfilling a mission. Recent developments in diving helmet design have demonstrated the feasibility of significantly improving the breathing gas/water interface performance capabilities and the ability to keep contamination in the surrounding water from entering the helmet or suit.

Specifications Required: The regulator, exhaust valve and their component materials must be impermeable to and not degraded by subject contaminants for the full mission period, usually 4-6 hours. System performance must not be degraded from current performance levels. Additionally, the modified helmet's work of breathing should not increase over current levels.

Technology Developed: PDS is the only chemically compatible system that fully isolates a diver including the breathing train and dry suit interior from a contaminated environment. PDS eliminates the back contamination of and direct exposure to aerosols, particulates, diseases, fumes and gasses generated by the action of the in-water exhaust valve and by the failure of exhaust valve and regulator diaphragm materials when exposed to a contaminated environment. It also does not allow for the permeation of contaminants through materials such as the silicone demand regulator diaphragm. The system mimics current system work of breathing performance.

Warfighter Value: Paragon's PDS will reduce diver exposure to chemicals and biological contaminants including those that cause cancer in veteran divers. The system eliminates excessive maintenance and replacement costs when non-certified systems are used in contaminated environments. PDS also reduces logistical demands of contaminated water operations.

WHEN

Contract Number: N00024-14-C-4061 **Ending on:** February 28, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Suit Dump Valve (SDV) Redesign Complete	N/A	Smaller and lighter SDV designed/tested to perform as needed	5	October 2015
Unmanned Safety Testing at Navy Experimental Diving Unit (NEDU)	Med	Results show that PDS is safe to an operable depth	6	September 2016
Manned Form Fit and Function Testing at NEDU	Med	Results show PDS is functional to an operable depth	6	October 2016
PDS Class 1 Certification Obtained for Operable Depths	Med	Initial certification tests at NEDU complete and final report delivered	7	February 2017

HOW

Projected Business Model: PDS will upgrade/modify the existing or new Navy-inventoried KM-37 system. Paragon plans to provide PDSs for small quantity orders. Paragon's in-depth familiarity with the technology and mix of prime market sectors illustrates the ability to market, manufacture, assemble, distribute, sell & service resource(s) for domestic and international business. Paragon plans to create marketing and support arrangements with an established diving equipment supplier.

Company Objectives: Paragon's goal is to be the leader in thermal control and life support in extreme environments for NASA, military, industrial and commercial programs/applications. Paragon is seeking DoD and other Federal agency surface diving teams that operate in hazardous contaminated environments to be outfitted with PDS. Paragon is also attempting to create licensing agreements based on obtaining Category I Certification, and is seeking an established provider of diving goods to market/sell the system to their existing commercial customers.

Potential Commercial Applications: The PDS enables safe deployment of divers in a wide variety of routine and special circumstance situations such as disaster recovery and rescue operations. Many states and municipalities utilize dive teams for contaminated water situations, from chemical spills to sewage system repairs. Even low contaminant concentrations in the water are in effect amplified by the high pressure and full immersion conditions experienced by the diver. Commercial applications may also be found in the energy, security, safety and transportation sectors. Paragon's PDS is one of the first products in Paragon's technology series for rapid decontamination, breakthrough detection of chem/bio contaminants, increased environments capabilities, thermal control, and remote rebreather units. A PDS derivative has the potential for use with self-contained breathing equipment used in diving, rescue, HAZMAT and similar applications.

Contact: Dennis S Williams, BD Director
dwilliams@paragonsdc.com (303) 588-5780