Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2020-722

Topic # N181-008
Maritime Lethality Analysis Toolset
Karagozian and Case, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA 242 Direct and Time-Sensitive Strike

Transition Target: Weapon programs or maritime targets that are in the design, test, and evaluation phases; Integration into the Joint Munitions Effectiveness Manuals (JMEM) Weaponeering System - or JWS

TPOC:
(760)939-3942

Other transition opportunities:
Programs for the generation of ship models

Notes: The image illustrates the interface available to the user of the Maritime Lethality Analysis Toolset (MLAT) application. In the 3D view, a ship model ready for analyses generated with MLAT.
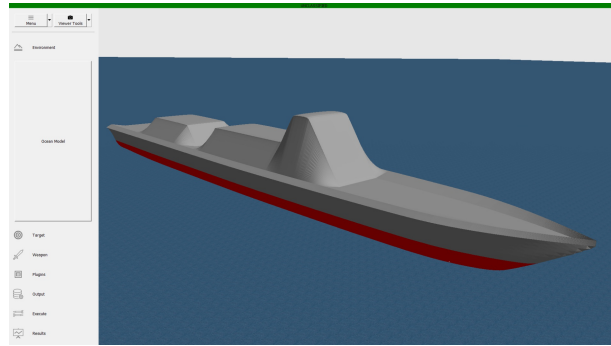

Image Courtesy of Karagozian & Case

WHAT

Operational Need and Improvement: In order to properly assess weapon effects on maritime targets, an advanced, in-depth, high resolution/fidelity Vulnerability/Lethality (V/L) analysis lethality toolset capable of providing engineering-level solutions in support of developmental/fielded maritime warhead lethality studies analogous to target weaponeering analysis toolsets is needed.

Such a toolset would enable end users to develop/implement new models/modules through a common physics-based approach, as well as allow leveraging of existing Government off-the-Shelf (GOTS), Commercial off-the-Shelf (COTS) and/or Open Source data/algorithms by integrating them onto a unified tool.

Specifications Required: The software shall be simulation-based and support the following weapon effects: interior and exterior air blast, fragmentation, inert/reactive particles, shaped charge/explosively formed projectiles, and kinetic energy penetrators. Different defeat mechanisms for structures and internal components shall be available, such as modules for the prediction of structural failure, debris generation, and functional failure analysis. Demonstrate and validate the ability to import multiple types of general-purpose and Government-developed CAD files, along with cross-OS compatibility of the analysis toolset.

Technology Developed: Karagozian & Case (K&C) has developed a Vulnerability/Lethality (V/L) analysis software program for maritime targets which can be used to determine the terminal effects of multiple weapons/munitions against maritime targets. The program features an automatic 3D ship target generator, computational modules for damage mechanisms of interest to the Navy (blast, fragments, penetration, flooding, fire, etc.), and a software engine to manage the simulation as well as quantitative and visual results.

Warfighter Value: K&C's V/L analysis technology provides warfighters with a V/L toolset that enables preparation and simulation of maritime warfare scenarios. The advanced automated technology for the generation of target ships feature consists of a fully developed methodology for the creation of structural and infrastructural components. The technology improves and supports quantification of uncertainties for attacks, weapons, and targets.

WHEN

Contract Number: N68936-20-C-0025   **Ending on:** November 30, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Software alpha release	Med	Alpha version of target model generator, full integration of weapon effects modes and defeat mechanisms.	4	November 2020
Validation and Verification of modules	Med	All the modules are validated, preparing the path for potential certification of the methodology.	5	November 2021
Maturation of target generator technology	Med	Beta version of target model generator. Multiple ship classes and advanced features are available to the user.	5	November 2021
Integration of high fidelity codes	Med	The software is able to execute calculations leveraging high fidelity software for increased accuracy.	6	January 2022

HOW

Projected Business Model: K&C's business model is to license the software to the Government, support and maintain the product. The ultimate goal is to obtain Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) approval and certification for the MLAT software and its methodologies and for K&C's V/L software to become the software of choice of mission planners, analysts, and engineers to predict/analyze the terminal effects of multiple weapons/munitions on maritime targets.

Company Objectives: K&C short term objective is to transition to verification, validation, and accreditation. This effort will require additional funding to support additional demonstration and integration efforts. Potential funding sources are the SBIR Commercialization Readiness Program (CRP), the Rapid Innovation Fund (RIF), and the JTCG/ME program. A demonstration of the alpha version can be made and marketed in order to reach the audience that can provide sponsorship for CRP, RIF, or JTCG/ME funding to enable the maturation and transition of the tool. K&C is also working with NAVAIR to define a roadmap for integrating the application into System of System Test Environment (SoSTE). In parallel to that, additional funding may come from the desire of the community to extend the software capability to work with high-fidelity computational codes. K&C will obtain support for Endgame Framework (EF) for the maturation and maintenance of the product.

Potential Commercial Applications: There is a broad range of potential applications for this technology. First, the technology can directly contribute to increase the V/L warfighters readiness for maritime warfare scenarios. Secondly, the automatic generation of targets can ease the generation process of ship models and can be of high interest for all simulation tools that requires accurate models. Finally, the application can be integrated into tactical tools and used for the terminal effects simulation. Commercial applications could include the support of the Tri-Service community, the Department of Homeland Security, the U.S. Coast Guard, Federal Bureau of Investigation, and maritime companies supporting anti-piracy and maritime terrorism studies. Commercial shipping could also utilize this analysis toolset as a validation tool for their designs.

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