

# Department of the Navy SBIR/STTR Transition Program

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MCSC-PRR-3624

Topic # N172-101

Shipboard Dimensional Analysis Tool (SDAT)

Design Mill, Inc.

## WHO

**SYSCOM:** MARCOR

**Sponsoring Program:** MCSC, DC Systems Engineering Acquisition and Logistics (SEAL)

**Transition Target:** PEO Land Systems

**TPOC:**

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**Other transition opportunities:**

Organizations with transportability analysis needs to include PFM LCES, Marine Corps Ground Vehicle Acquisition Program Management Offices, NAVSEA (PEO Ships), Industrial Warehousing, Military Sealift Command, TRANSCOM, Navy Amphibious and Prepositioning Ships Program Management Offices, Shipping Industry, and the Space Optimization Industry. The goal is to provide a valid 3D virtual means of transportability analysis to vehicle or ship programs contemplating a design or design modification.

**Notes:** The above image from the current development version of SDAT illustrates points of impact between a Humvee and a bulkhead in a vehicle storage area aboard LPD-17. (2) Design Mill anticipates connecting with commercial companies that need a capability similar to SDAT to support vehicle or facility design and modifications. (3) Design Mill also plans to enhance SDAT further with a hardware offering that has continuous scanning capability that capture a ship, facility or warehouse in real-time to automatically generate inputs for SDAT and ultimately track facility modifications and/or stored assets.



Design Mill Image of SDAT Analysis Capability

## WHAT

**Operational Need and Improvement:** Marine Corps Ground Vehicle Acquisition PMOs and Navy Amphibious and Prepositioning Ships PMOs do not have a precise way of determining shipboard vehicle transportability constraints early enough in the design process. Current methods of assessing transportability involve vehicle prototyping, and taking internal measurements of ships in various locations to include angles at the tops and bases of ramps to ensure clearance and identifying obstacles to include pipes, wire bundles, lighting, and other types of fixtures. A three-dimensional virtual means of conducting valid shipboard transportability assessments for vehicles and vehicle modifications as early as possible in the acquisitions process will reduce cost and schedule associated with the design of vehicles suitable for deployment aboard amphibious and preposition ships.

**Specifications Required:** The Shipboard Dimensional Analysis Tool (SDAT) is a 3D virtual capability that allows an engineer or analyst to pull up the desired 3D ship data (typically a ship point cloud derived from a LIDAR scan), select or upload 3D vehicle data (typically a vehicle CAD model), specify desired vehicle-to-ship clearance distance, select a path through the ship, conduct 3D physical interference analysis, and generate reports and products to support vehicle design decisions. The tool's user interface must be intuitive. It must allow for a fine level of detail, calculating for collisions at increments of one inch (objective) or every foot (threshold) along a selected path. The threshold and objective times to complete collision computations for a 300-foot path with a one-inch distance interval are five minutes and one minute, respectively. Finally, it must provide valid and verifiable results.

**Technology Developed:** The Shipboard Dimensional Analysis Tool (SDAT) integrates hardware, software and cloud solutions enabling virtual transportability assessments for vehicle designs. It integrates 3D ship and vehicle data with game engine and machine learning technology and uses novel methods of rendering surfaces and computer processing to enable path selection, collision computation and analysis in 3D virtual environments. Each element of SDAT has been successfully demonstrated and integration is underway.

**Warfighter Value:** SDAT's 3D virtual and augmented reality capability will reduce cost and schedule requirements associated with the design of vehicles suitable for deployment aboard amphibious and Maritime Preposition Ships by removing the requirement for prototyping for transportability analysis.

## WHEN

**Contract Number:** M67854-19-C-6506 **Ending on:** September 26, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Initial Functional Prototype of Capability 2.9.1	Low	Integration of Visualization, Voxels, Navigation and Collision Modules	6	4th QTR FY20
Graphical User Interface(GUI) Prototype Complete 2.1.2	Low	Demonstrate Functionality of User Interface	7	1st QTR FY21
Collision Detection Module Integrated 2.3	Low	Successful Demonstration of Collision Calculations within the prescribed time limit with error minimized	7	1st QTR FY22
AI Navigation Module Integrated 2.2	Low	Successful Demonstration of AI path Generation based on user input	8	1st QTR FY22
SDAT Prototype Complete 2.9 (Full Demonstration)	Low	Successful Demonstration of all project objective to sponsor and key stakeholders	8	3rd QTR FY22
Commercial Software Available	Low	Product available for sale	9	4th QTR FY22

## HOW

**Projected Business Model:** Design Mill plans to build the SDAT business model around software licensing as a standalone product and to other software vendors that would need to incorporate dimensional analysis in their offering as a software plug-in. Our software will be cloud based with tiered pricing based on number of users, amount of data, number of assets, and storage size. We anticipate a set-up fee per customer that includes hardware and software installation, testing, and shipment of hardware. We anticipate customization of the software based on end user use cases (ships versus warehouses); on-going maintenance will keep SDAT infrastructure current with modern cloud offerings.

**Company Objectives:** Design Mill is a strategic systems integrator delivering pioneering solutions for the Department of Defense and industry-leading organizations. A three-time recipient of the Intel Software Innovator of the Year award, Design Mill continually works to transform the integration of cutting-edge interactive hardware and software through innovative design, development, and processes. We have a long history of commercializing software products, SDAT is one of those technologies we are bringing to market. We are interested in talking with Prime Contractors (Shipbuilding and others), any logistic related programs, as well as Program offices that would like to analyze their capabilities throughout a mission.

**Potential Commercial Applications:** Design Mill Inc is planning to commercialize SDAT where laser scanning and 3D models are used for analysis. The end use cases we anticipate solving first are industrial warehousing and ship loading but can be expanded to numerous applications where space planning/utilization is a critical process. Ships and vehicles are the initial focus but warehouse equipment and assets will be second. Industries we are targeting include logistics, aviation logistics, rail, factory planning, port operations, and law enforcement (forensics). Follow-on applications will come with hardware development and installation that enhance SDAT's capability with continuous laser scanning. We also are planning a technology roadmap that integrate software enhancements for artificial intelligence, improved AI navigation and feedback from actual loading sequences to deliver additional capabilities and revenue streams.

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