

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-843

Topic # N092-111

Development and Validation of an Advanced Simulation Tool for the Evaluation of Aerial Refueling Events
SDI Engineering Inc

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-201

Transition Target: NAVAIR's Manned Flight Simulator

TPOC:
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Other transition opportunities: Each Naval aircraft platform has their own training and flight simulator programs. ARES is applicable to any Naval aircraft that is configured for aerial refueling. Other possibilities include the CV-22 and H-47.



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WHAT

Operational Need and Improvement: U.S. Naval aerial refueling is a complicated operation in which a receiver aircraft connects to a tanker aircraft utilizing a hose, drogue, and probe system. This is a difficult task for the receiver pilot and involves complex aerodynamics, structural dynamics, and control system response. In order for pilots to practice aerial refueling in a flight simulator, the dynamics of the hose, drogue, and associated subsystems must be visualized accurately.

Specifications Required: NAVAIR's Manned Flight Simulator group requires improved accuracy of their existing aerial refueling simulations in order to provide realistic visualizations of hose and drogue dynamics to pilots while training in the simulator.

Technology Developed: ARES is an aerial refueling modeling and simulation tool that utilizes a multibody dynamics approach to study the dynamic behavior of the hose and drogue, reeling mechanism, engagement mechanism, probe, and the resulting loads during aerial refueling operations. ARES can be integrated into manned flight simulators in order to improve the accuracy of aerial refueling visualizations and pilot training.

Warfighter Value: When integrated into manned flight simulators, ARES improves the accuracy of refueling visualizations, improves pilot training and efficiency - thereby potentially increasing safety by reducing the frequency and severity of accidents and incidents, and increases operational efficiency. ARES also enables the detailed analysis of aerial refueling operations for new technologies, incident investigations, evaluations of flight control or maneuver strategies, and probe loads predictive analysis for design, flight testing and certification of future aircraft platforms and aerial refueling systems.

WHEN

Contract Number: N68335-18-C-0026 Ending on: March 31, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Validation of Hose Dynamics and Probe Loads Against Flight Test Data	Med	Accurate predication of hose and subsystem dynamics and probe loads	5	January 2020
Integration of Full Fidelity ARES Models into Controls Analysis and Simulation Test Loop Environment (CASTLE)	Low	Integration into CASTLE is complete; validation is ongoing	6	March 2020
Integration of Real-Time ARES Models into CASTLE	Med	Successful Pilot-in-the-loop Simulations with ARES	7	March 2020

HOW

Projected Business Model: The technology transition model involves the development, validation, and commercialization of the ARES software tool for use in flight simulators and for detailed design and analysis of aerial refueling systems and components.

Company Objectives: SDI Engineering's goal is to develop ARES as the software tool of choice for use in flight simulators and in the design and development of aerial refueling systems.

Potential Commercial Applications: Each Naval aircraft platform has specific training and flight simulator programs - typically developed by a prime contractor. In partnership with these primes, SDI will support integration of ARES into flight simulators for any aircraft configured for aerial refueling. SDI is also open to working with primes who develop, manufacture, test, and use aerial refueling equipment and/or rely on aerial refueling modeling and simulation for design and analysis.

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