Department of the Navy SBIR/STTR Transition Program
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NAVAIR 2018-789

Topic # N15A-T002
Advanced Wake Turbulence Modeling for Naval CFD Applications
Continuum Dynamics, Inc.

WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-274 The Presidential Helicopters Program Office

Transition Target: Navy and industry engineers supporting current operations, air vehicle platforms, future systems and mission developments.

TPOC:
(301)342-8548

Other transition opportunities: Engineers within Department of Defense and industry supporting current operations, air vehicle platforms, future systems and mission developments.

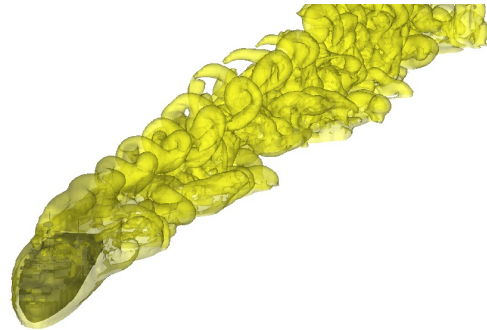**Notes:** Image shows a prediction of the ship airwake behind an amphibious transport dock.

Image Courtesy of Continuum Dynamics, Inc. 2018

WHAT

Operational Need and Improvement: Predicting the viscous, turbulent flows around naval vessels and ship-suitable rotorcraft/aircraft with Computational Fluid Dynamics (CFD) is necessary to support current and future operations, testing and the development of new systems. Unfortunately, current CFD tools are too expensive for many routine design and analysis tasks that involve vorticity dominated flows. Continuum Dynamics, Inc. (CDI) is developing an innovative CFD solver software library that can be coupled to current CFD tools to reduce the cost of unsteady predictions by several orders of magnitude.

Specifications Required: The CFD solver library will be physics-based, be portable between computer platforms and engineering analysis tools, and demonstrate reductions in computational cost compared to contemporary CFD tools.

Technology Developed: CDI is developing a high fidelity CFD library integrated with DOD software for increasing the accuracy and reducing the cost of undertaking engineering analysis of current and future air vehicles and ship board/dynamic interface operations. The CFD flow solver library has demonstrated several orders of magnitude cost reduction over contemporary approaches, and has been coupled to numerous CFD solvers. Integration with DOD CREATE-AV CFD solvers used by the Navy is ongoing. CDI has an extensive history developing innovative numerical algorithms and CFD methods. The modular nature of the software library makes extensions and upgrades seamless to the end-user and enables it to be integrated into numerous analysis tools used by the Navy, DOD and industry. The first-principles formulation makes the software applicable to a wide variety of applications.

Warfighter Value: CFD is critical to supporting current and future air vehicle design and, shipboard/dynamic interface operations. Unfortunately, current CFD software is too time consuming for many applications. Improved CFD software directly reduces the cost of supporting operations; improves the safety and capabilities of current and future platforms; and reduces the cost and risk of platform development and aircraft-ship compatibility testing.

WHEN

Contract Number: N68335-17-C-0158   **Ending on:** March 31, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Alpha prototype software delivery	Med	Software successfully integrates with CFD analysis tools used by the Navy	4	April 2018
Beta prototype software delivery	Med	Software successfully integrates with CFD analysis used by the Navy and shows improved performance	6	October 2018
Final software delivery	Med	Software successfully integrates with CFD analysis used by the Navy and shows improved performance	7	April 2019

HOW

Projected Business Model: Continuum Dynamics, Inc., specializes in predicting unsteady fluid-structure interactions, most notably for rotorcraft and dynamic interface applications, and in developing highly efficient analysis software and software libraries to support engineering design and analysis. Our primary business model is to license analysis software and provide support and research and development services to the Government and industry.

Company Objectives: CDI anticipates that the Forum for SBIR/STTR Transition event will provide an opportunity to make connections with Government and industry personnel that that are involved in supporting operations and platform development and have a need for improved CFD prediction. Our goal is to broaden our CFD software market share and to expand the level of support that we can provide our customers in Government and industry.

Potential Commercial Applications: Understanding unsteady fluid dynamics is critical to many applications, and thus an improved CFD solver would have application to numerous industries. Potential commercial applications include fixed and rotary-wing aircraft development, electric power generation (wind turbine design, gas turbines and flows in heat exchangers), automobile design, architectural engineering and heating, ventilation and air conditioning.

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