

# OVERVIEW OF THE DYNAMIC SYSTEM MECHANICS ADVANCED SIMULATION CODE

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## ABSTRACT

DYSMAS is the most extensively validated full-coupled hydrocode for the simulation of underwater explosion phenomena and their effects on marine structures. DYSMAS delivers a government-developed, government-owned hydrocode whose application space continues to expand within the Navy and out to other organizations. DYSMAS has been developed as a partnership between the United States and the Federal Republic of Germany over the course of 20 years and represents over \$50M of joint investment. DYSMAS enables rapid and cost-effective simulation of weapon effects, thus cutting design time and cost for both weapons and platforms, as well as enabling simulation of weapon/structure events which would be enormously expensive or impossible to carry out in live-fire tests. Using a robust embedded mesh coupling technique, DYSMAS couples massively-parallel, high-fidelity fluid dynamics and structural solvers to accurately simulate explosive output of weapons and the resulting structural response. DYSMAS addresses the Navy need for the capability to predict UNDEX effects where there is a strong coupling between loading and structural response. DYSMAS was initially developed for undersea weapons applications, but the relevance to broader weapon effects and target response to include air blast and non-DoD has become increasingly pertinent. DYSMAS has found usage in other important defense and homeland security applications, and is now actively distributed to over 200 users supporting four major usage areas: naval weapons, naval platforms, critical infrastructure vulnerability, and vehicle blast protection.