# HIGH FIDELITY CFD SIMULATIONS OF COMPLEX MULTI-ROOM TARGET DEFEAT USING ENERGETIC EXPLOSIVES

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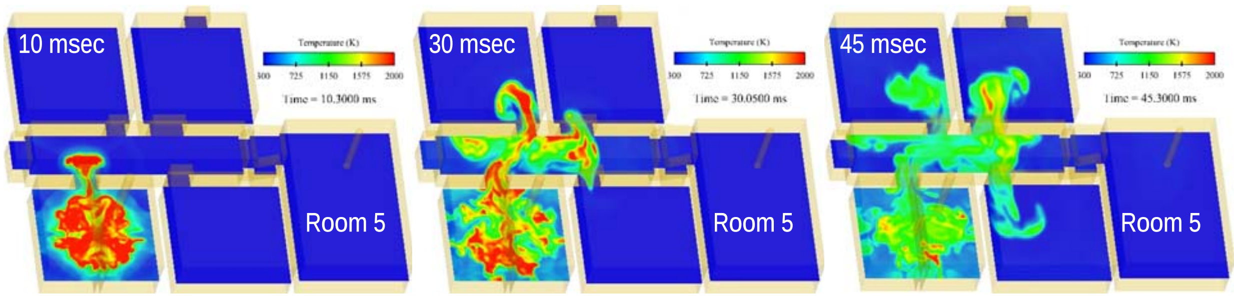
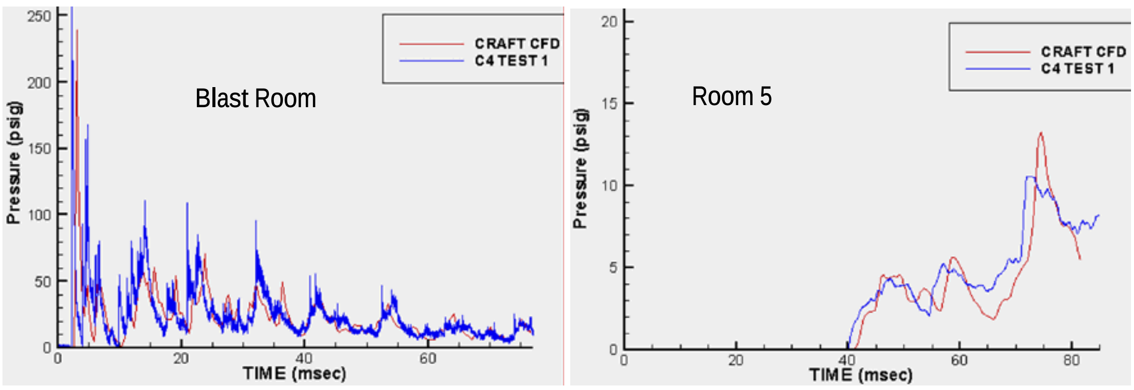
This paper will present an overview of high-fidelity, high resolution Computational Fluid Dynamic (CFD) simulations that analyze the effects of energetic explosives in confined environments, and compares predictions with available pressure trace/impulse data sets. The CFD simulations correspond to explosive charge tests conducted at a Multi-Room Test Facility (MRTF) that featured a five-room structure. The CFD simulations shown below represent a test with a conventional C-4 charge. The CFD results show that afterburning of the fuel rich detonation products is a key determinant of shock propagation within the complex multi-room structure. Aerobic or afterburning combustion of fuel-rich detonation products was modeled using a first-principles approach that had been validated earlier against fundamental laboratory data. The dispersed-phase heterogeneous combustion model also accounts for afterburning with multiple oxidizers, e.g. $O_2$, $CO_2$ & $H_2O$. Furthermore, the reduction in burn rate of smaller metallic particles due to kinetic rate constraints (as opposed to typical "$d^2$-type" droplet combustion modeling) was shown to be a major inhibiting factor that limits performance of explosives with significant metallic content. The CFD simulations have highlighted the effectiveness and limitations of utilizing explosive formulations for achieving desired dispersion patterns within complex multi-room structures.




**CFD Predictions of Temperature Contours in MRTF for C-4 Shot**




**Comparisons of CFD Predictions of Pressure with MRTF Test Data for C-4 Shot**