# QUALIFICATION STRATEGY OF THE SEQUENTIAL FLUID/STRUCTURE NUMERICAL SIMULATION APPROACH THROUGHOUT THE FRENCH/GERMAN COOPERATION

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**Abstract:**

This paper is part of a Fr/Ge Technical Arrangement on the "Vulnerability of Systems exposed to Blast and Thermal Effects". It presents a numerical study based on experimental results. This study helped on the validation of the CEA's simulation approach of structures under blast loads. It is based on a weak coupling approach which uses the CEA's CFD code OURANOS coupled with the commercial lagrangian code ABAQUS (CSD).
To do so, three experimental campaign have been conducted in the LBS tunnel of the WTD 52. The first one studied blast waves diffraction in a complex 3D environment using rigid blocks. The second one studied the behaviour of a light multi-storeyed reinforced concrete building. The last one studied the behaviour of empty and partially filled thin storage tanks.

For the first experiment, the complex environment was equipped with several pressure gauges to record incident and reflected pressures inside the tunnel and on all of the environment faces. The experimental results are reproduced with the hydrodynamic code OURANOS. This comparison allowed to validate the ability of the OURANOS code to simulate blast propagation and interaction with structures in a complex environment.
For the second experiment on the light multi-storeyed concrete building, the experimental results are compared to numerical simulation results using the CEA's sequential approach: the blast wave diffraction is calculated with the CFD code OURANOS coupled with the lagrangian code ABAQUS (CSD). The comparison of the experiment to the numerical simulation showed a good correlation.
The last experiment was conducted on cylindrical tanks with different heights and water levels (empty, quarter-filled, half-filled and three quarter-filled). Unlike the previous campaign, the sequential approach used a coupled Euler-Lagrange formulation in ABAQUS for the interaction between the structure and the water. The simulation of this experimental campaign showed the limitation of the weak coupling approach. This work has been supported by DGA.