A large number of cavitation models have been developed, which can be categorized into two main groups: two-fluid models and single-fluid models. Two-fluid models suppose an individual set of conservation equations to be solved for each phase. Eulenian-Eulenian two-fluid models incorporate a mass transfer due to phase transition between liquid and vapor phases at the phase boundary, which can be tracked by a sharp-interface method as proposed by Lauer et al. In opposite the presented model is one of the single-fluid models which treat the fluid as a continuous mixture of liquid and vapor solving a single set of constitutive equations characterized by average mixture properties, such as mixture density and mixture viscosity. The model is biased in comparison with the 2D representation of the wall. For better representation a scale of pressure field is introduced. The reflected shock waves do not travel towards the wall, so a weaker expansion in the region close to the wall than for the case in 2D. Close to the wall, a collapse accelerated in the region since the pressure here remains larger than at the top of the bubble. A cavity between wall and bubble develops with further increasing pressure (Fig. 1.4). This can be also seen in the three-dimensional case (Fig. 1.3). The bubble is deforming to a mushroom-like shape and shortly after establishment of the bubble the pressure rises dramatically and exceeds the magnitude of the pressure at the wall in the previous cases. Liquid shock wave, reflects in the center region, generating a fast flow from the wall towards the remaining bubble. The pressure increases again when the rest of the vapor condenses, causing the collapse of the bubble. The pressure magnitudes are small and occur away from the wall. The emitted shock wave hits the wall with the pressure around 10 000 bar. The rebound of the vapor bubble occurred afterwards is presented on Fig. 3.2.

As far as the initial pressure field was set constant one can observe spurious vapor regions close to the wall. It happens due to the pressure jump over the bubble surface generating expansion waves. They intersect in the anesse close to the wall and the pressure value decreases enough to treat these cells as vapor containing. Although in the current investigation it did not influence crucial since all critical events such as a jet development, impacts, shocks propagations represented and correspond well with the two-fluid modelling. Nevertheless for more complicated setups e.g., a bubble cloud collapse it is essential to initialize pressure field according to the Laplace law. This was not applied in the case for a better similarity with the original research. Results, which are obtained with the single-liquid model, compare well to the findings of Lauer et al., and in addition describe the formation of vapor in the low pressure regions after the initial collapse.

The performances of interface-tracking technique and interface-capturing technique were compared on the case of detached and attached vapor bubbles close to the wall. The instant pressure and density fields were obtained. The deformed shape of the bubbles are represented with iso-surfaces of vapor ratio 0.05. It was shown that the single-liquid approach acts highly efficient for sharp interface modelling and can be applied for relevant simulations.