Potential role of scaling factor in turbulent mixing problem

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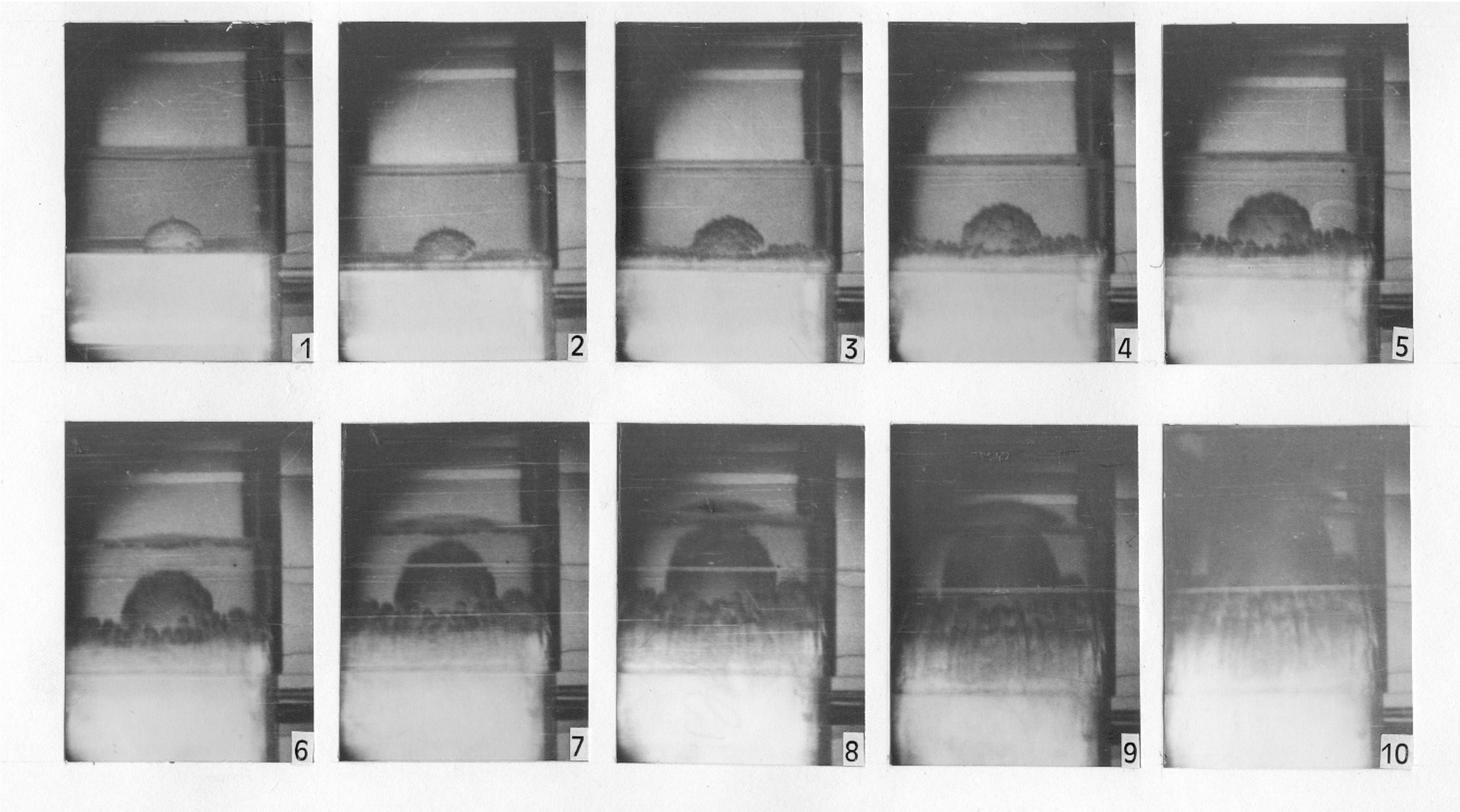

Fig.1. The growth of local perturbation as semi-sphere cavity at the unstable jelly layer boundary accelerated by compressed gas. Originally, the perturbation growth is observed both on plane and spherical interface surfaces (photographs 1-5).At later times, the growth continues in the planar part to reach the mixing zone while the perturbations are smoothed out in the spherical portion. [12].

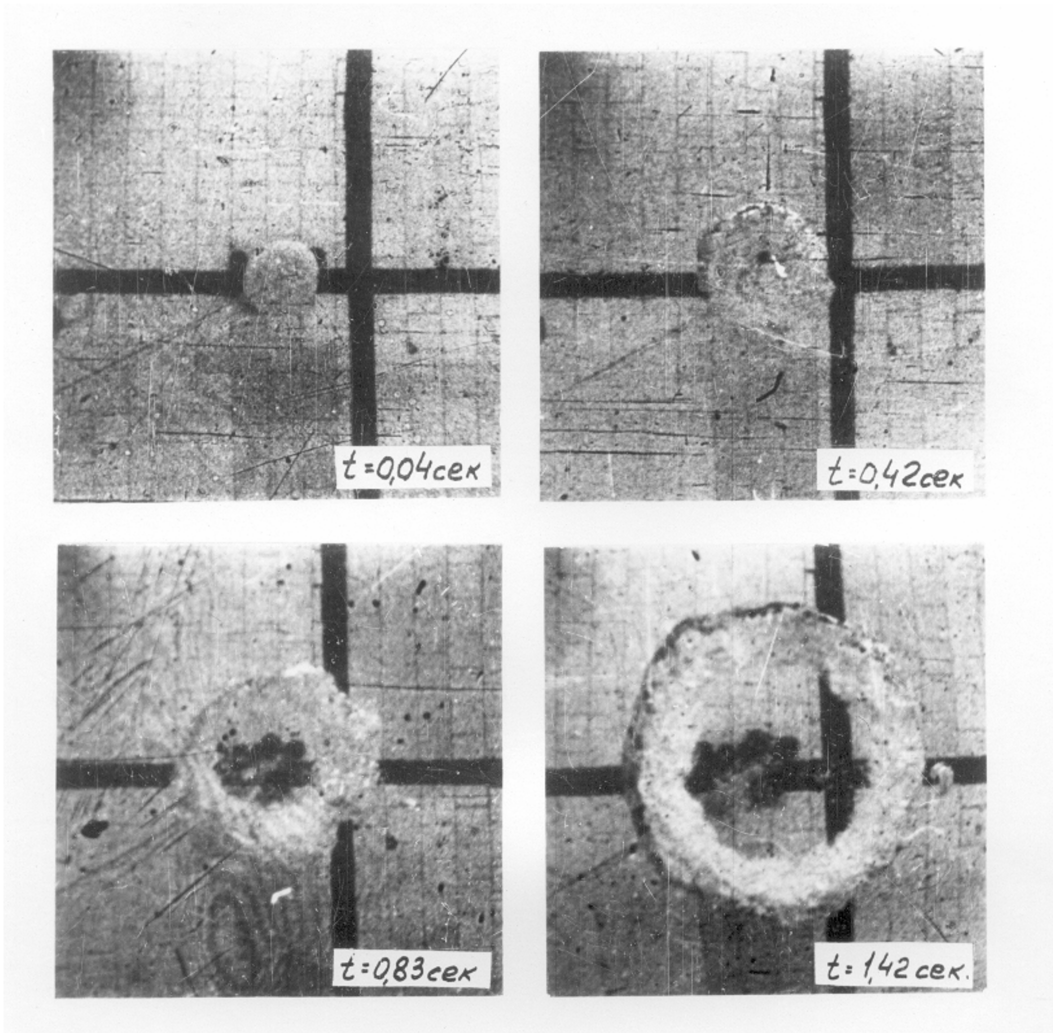

Fig.2. A large bubble rising up from the rest state converts to a rotating vortex ring consisting of small bubbles [14].

The above statements suggest that irrespectively of the acceleration value (including $g=g_o$, *i.e. in the gravity field of Earth)* one can expect the stable evolution pattern to change as the turbulent mixing zone grows at the Rayleigh-Taylor instability gas-fluid interface when gas bubbles penetrating the fluid reach a given size. Hence, we can expect the changes in the penetration rate of the mixing zone front moving to the fluid since the "rise-up" rate of bubbles is known to be related with the bubble sizes.

Since the scale of forces leading to the growth of the mixing zone is related with the interface acceleration in a straightforward manner then we can expect that critical bubble size (which suggests the change in the stable growth mode) will be determined b the acceleration value. In other words, we can anticipate that some stage of the zone growth would demonstrate the decrease in the penetration rate of the bubble front moving to the fluid caused by lower bubble size.

The anticipated experiment scenario is described below (Fig.3).

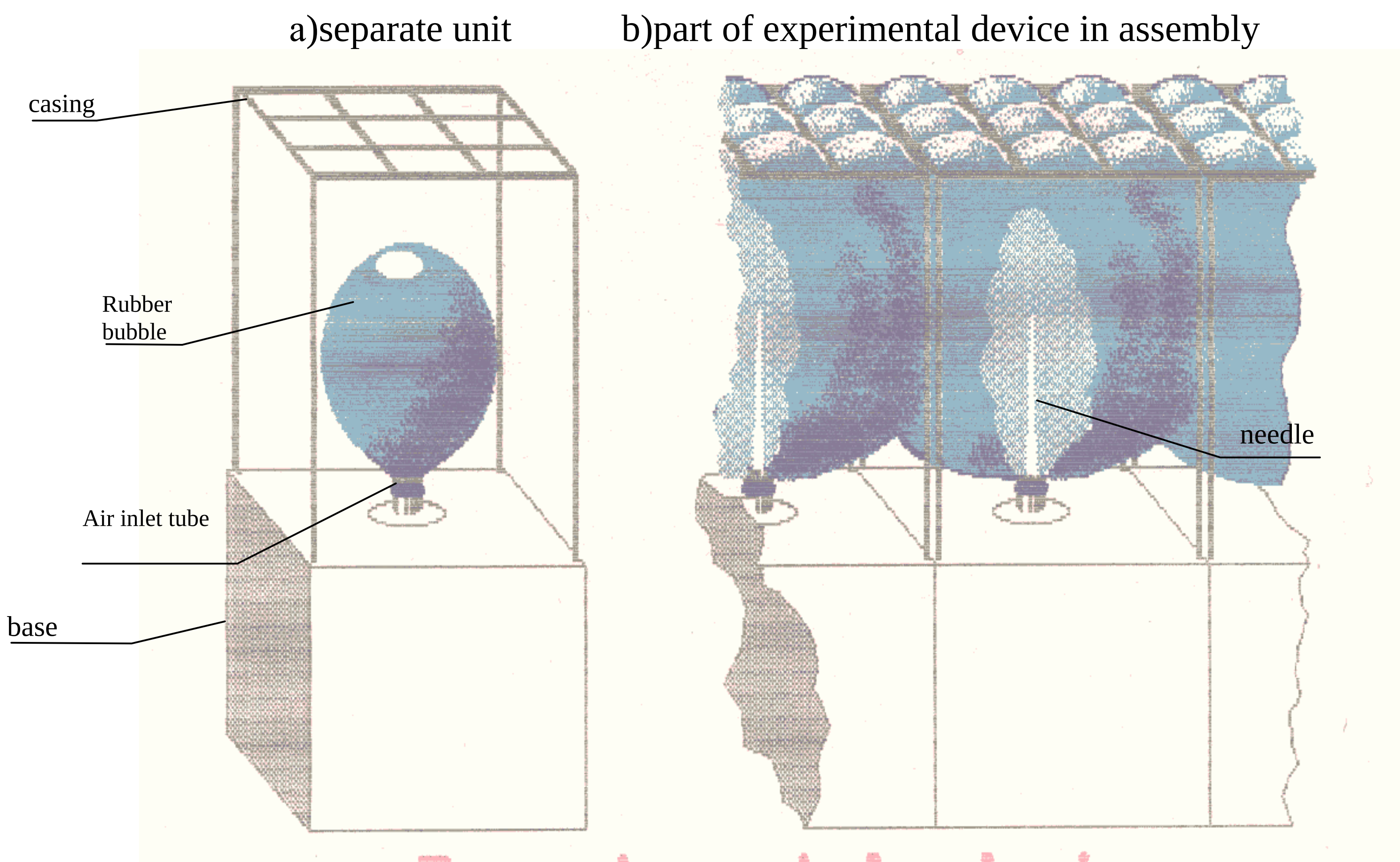

Fig.3. Potential experimental device scheme for verifying the scale impact on the turbulent mixing zone at the gas-fluid interface. The experimental device (right side elevation) consisting of separate units (left side elevation).

Finally, one can also use computer numerical) simulation to predict the lost of the rising-up bubble dome based on available (and possibly additional) experiment data; later we could model the turbulent mixing zone growth considering the surface tension.