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ABSTRACT

Drop and bubble dynamics investigations on Earth and in low gravity using ultrasonics. Eugene H. Trinh (MS 183-401, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109)

Two ultrasonic devices for the positioning and the remote manipulation of free drops and bubbles have been used during the recent STS-94 Spacelab flight. One apparatus is designed to levitate or to position single or a small number of individual droplets in air, to induce drop shape oscillations, and to control the residual drop rotation. implementation in low gravity has allowed the measurement of droplet dynamics and rotational stability in the absence of the overwhelming constraint imposed by the high intensity ultrasonic field required for levitation on Earth. The second apparatus permits the trapping or positioning of gas bubbles in a water-filled resonant cell with square cross-section. Confirming earlier results from a previous flight experiment, we found that gravity plays a determining part in the stable centering of bubbles larger than resonant size. Both devices operate at about 22.5 kHz and allow the monitoring of the drop or bubble motion through the detection of scattered light from a collimated diode laser beam illuminating the fluid particles. These investigations are low-cost, they are built from commercial 1 y available components, and they are manually operated by crew members in the Middeck/Spacelab Glovebox facility. [Work funded by NASA].