UNIVERSITY OF MICHIGAN
DEPARTMENT OF MECHANICAL ENGINEERING
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DISCUSSION OF

SHOCK-EXCITED PULSATION OF LARGE AIR BUBBLES IN WATER
by F. B. Jensen, Trans ASME, J. Fluids Engineering, 96, Series 1, No. 4, December 1974, 389-393.

by

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Discussion by F. G. Hammitt of "Shock-Excited Pulsation of Large Air Bubbles in Water", by F. B. Jensen, Trans. ASME, J. Fluids Engineering, 96, Series 1, No. 4, Dec. 1974, 389-393.

The interaction of a pressure shock wave passing through a liquid with entrained gas or vapor bubbles as studied by the author is of course of interest from the viewpoint of the absorption of the shock wave energy by the bubbles, and its consequent attentuation as he indicates. It is also of interest from the standpoint of basic cavitation bubble dynamics and improved understanding of the concomitant damage phenomenon. In actual cavitation flow regimes, there are of course a multiplicity of bubbles of various sizes and in various stages of growth and/or collapse. No doubt there is significant interaction between the various bubbles under these conditions, although, because of the obvious practical difficulties, very few attempts have yet been made to study these effects either analytically or experimentally. One of the important effects should be the interaction between shock waves generated by collapsing or rebounding bubbles and neighboring bubbles, which may be either collapsing or growing at that instant. One of the important effects of such shock wave impingement, particularly, upon collapsing bubbles, should be the triggering of asymmetries in the collapse,perhaps hastening the formation of a jet-type collapse, which, depending upon many other factors, might act either to enhance or inhibit cavitation damage in that particular situation. I believe this mechanism was previously suggested by Kozyrev (1), but no really detailed research in this direction has as yet been done to my knowledge. In this laboratory (2) we have made the only (to my knowledge) detailed numerical study of the interaction of a steady and uniform pressure gradient with a collapsing bubble. This analysis showed that the effect of the pressure gradient was much the same as that of other imposed asymmetries (which we also studied) such as an external translatory velocity and the proximity of a wall The last situation was also studied by Plesset and Chapman (3).

References

1. S. P. Kozyrev, "On Cumulative Collapse of Cavitation Cavities", Trans. ASME, J. Basic Engr., 90, D, 1, March 1968, 116-124.

2. T. J. Mitchell, F. G. Hammitt, "Asymmetric Cavitation Bubble Collapse", Trans. ASME, J. Fluids Engr., March 1973, 29-37.

3. Plesset, M.S. and Chapman, R. B., "Collapse of an Initially Spherical Vapor Cavity in the Neighborhood of a Solid Boundary", J. Fluid, Mech., 2, 47, May 1971, 283.