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DISCUSSION

V. H. Arakeri[1]

The author is to be congratulated on making a most useful contribution to our existing knowledge concerning mechanism of cavitation inception on axisymmetric headforms. It is clear that several different types of cavitation at inception have been observed and the author has rightly taken the trouble to classify the inception data in an orderly manner. However, it is not clear whether the travelling bubble type of cavitation referred to by the author for headform S_{10} is of the same type as for headform T_8. From the measured values of σ_i it appears that for the headform $S_{10}(\cong 0.6 \cong -C_{p\min})$ traveling bubble cavitation may be of the type first photographed by Knapp, et al. [22] and for the headform $T_8(\sigma_i \cong 0.4 \cong -C_p)$ traveling bubble cavitation may be of the incipient spot type described by Arakeri and Acosta [5]. In this context it would have been of considerable help to readers if the author had provided actual photographs or at least a sketch of the different types of cavitation observed by him at inception.

Concerning the flow regimes on various headforms it is of interest to note that there is now overwhelming evidence that axisymmetric bodies of the type hemispherical nose, ITTC body, NSRDC body and 1.5 cal ogive which possess a discontinuity in the body curvature (ie second derivitive) at the tangent point are prone to laminar separation and in addition, the position of separation has been found to be quite close to the tangent point. Are the author's findings consistent with this in the sense that the headforms T3, T6, and T8 are free from curvature discontinuities.

Finally, it is proposed that a consistant set of definations (or descriptions) be evolved to characterize different types of cavitation at inception. The following set is suggested at least for axisymmetric headforms.

Type of cavitation	*Physical description*
1) Travelling Bubble (T-B)	Exploding bubbles in the region of theoretical minimum pressure point as first photographed by Knapp [(22)], et al.
2) Shear Layer Bubble (S-L-B)	Bubbles in the free shear layer region of flow associated with disk, jet and other large separated region.
3) Band Bubble (B-B)	A ring of bubble close to the surface typically observed in the reattachment zone of small separated regions.
4) Band Attached (B-A)	Normally associated with laminar separation and having smooth surface at leading edge.
5) Spot Bubble (S-B)	A train of growing bubbles usually from fixed spots on the surface of the test body.
6) Spot Attached (S-A)	A developed cavity from a spot on the surface of the test body typically having wedge shape.

[1] Department of Mechanical Engineering, Indian Institute of Science, Bangalore, 560012, India

For hydrofoil sections the (7) Vortex Bubble (V-B) and (8) Vortex Attached (V-A) may be added to complete the list. However, it must be emphasized that as Professor Holl [23] has aptly pointed out that one must always be careful of distinguishing between gaseous, pseudo, and vaporous cavitation in comparing results.

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Author's Closure

The author expresses his gratitude to Professor V.H. Arakeri for his valuable discussion. The observed traveling bubble cavitation in this paper (headforms T-3, T-6, T-8, and S-10) was the same type photographed by Knapp, et al. The traveling bubble cavitation was usually detected slightly earlier than the attached spot cavitation on headform T-8. These two types of cavitation were observed at about the same value of $\sigma_i = 0.4$. At $\sigma < 0.4$ the traveling bubble cavitation was still observed intermittently even though a large amount of attached cavitation spots had developed at the location of $-C_{p\min}$.

The discontinuity in the body curvature (headforms S-1 and S-10) tends to cause laminar separation. The large adverse pressure gradient on headform S-2 is sufficient to cause laminar separation even though there is no discontinuity in the body curvature. It is true that headforms T-3, T-6, and T-8 are free from curvature discontinuity.

Following definitions proposed by Professor Arakeri, the traveling bubble cavitation observed on headforms T-3, T-6, T-8 is type T-B and the attached spot cavitation is type S-A. Cavitation on S-1 is type B-B. The cavitation ring observed on S-10 is type B-A. At $\sigma_i = -C_{ps}$ large splashing cavitation with wedge leading edge appears and disappears randomly around the separation line on S-2, and these cavitation spots merge together to form a ring cavity of type B-A.