Technical Comments

Comments on "A Study of Penetration of a Liquid Injectant into a Supersonic Flow"

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THIS Note is in response to a recent paper by Kolpin, Horn, and Reichenbach[1] concerning the penetration of liquid jets. It should be noted that only a portion of the data surveyed in Ref. 2 was compared with their new data.

Reference 2 develops theories that apply for two regimes, an acceleration wave regime and a capillary wave regime. Most of the experimental data available happens to fall in the acceleration regime. There is one set,[3] however, which is in the capillary wave regime and, as expected, does not correlate with the data in the acceleration wave regime. All the data considered in Ref. 1 was in the acceleration wave regime.

References

[1] Kolpin, M. A., Horn, K. P., and Reichenbach, R. E., "Study of Penetration of a Liquid Injectant into a Supersonic Flow," *AIAA Journal*, Vol. 6, No. 5, May 1968, pp. 853–858.

[2] Adelberg, M., "Breakup Rate and Penetration of a Liquid Jet in a Gas Stream," *AIAA Journal*, Vol. 5, No. 8, Aug. 1967, pp. 1408–1415. (Errata for this Ref. is in Ref. 4.)

[3] Fenn, D. B., "Correlation of Isothermal Contours Formed by Penetration of Jet of Liquid Ammonia Directed Normal to an Airstream," RM E53J08, Feb. 3, 1954, NACA.

[4] Adelberg, M., "Mean Drop Size Resulting from the Injection of a Liquid Jet into a High-Speed Gas Stream," *AIAA Journal*, Vol. 6, No. 6, June 1968, pp. 1143–1147.

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Reply by Authors to M. Adelberg

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AS is evident from the title of our article,[1] we were concerned only with liquid injection into a supersonic flow, whereas the data referred to by Adelberg are for injection into a subsonic flow.[2] The data are therefore irrelevant to our study, in which the correlation for penetration height was demonstrated for liquid injection with large Weber numbers into supersonic streams.

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References

[1] Kolpin, M. A., Horn, K. P., and Reichenbach, R. E., "Study of Penetration of a Liquid Injectant into a Supersonic Flow," *AIAA Journal*, Vol. 6, No. 5, May 1968, pp. 853–858.

[2] Fenn, D. B., "Correlation of Isothermal Contours Formed by Penetration of Jet of Liquid Ammonia Directed Normal to an Air Stream," RM E53J08, Feb. 3, 1954, NACA.

Comment on "An Investigation of the Effect of Suction on Hypersonic Laminar Boundary-Layer Separation"

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Nomenclature

c = width of flat plate
h = height of step
M_0 = inviscid Mach number of flow on surface upstream of ramp
M_∞ = freestream Mach number
P_w = surface pressure
P_∞ = freestream static pressure
Re_0 = inviscid-flow unit Reynolds number on surface upstream of ramp, in.$^{-1}$
Re_{x_0} = $Re_0 x_0$
x = distance from leading edge along surface, in.
x_0 = distance from the leading edge to the beginning of separation interaction, in.
θ = ramp deflection angle, deg

BALL and Korkegi[1] presented experimental pressure distributions for separated regions created by a slender wedge with various base-ramp compression angles at $M_\infty = 12.3$. They made the following statement in this paper; "The results of this investigation for the plateau pressure and no corner suction, as shown in Fig. 3, appear to indicate that the separations are not of the free interaction type. However, similarity scaling as suggested by Curle[23] of the streamwise coordinate x, reduces the pressure data into a similarity plot in excellent agreement with the data of Lewis.[22]" However, Lewis, Kubota, and Lees[2] concluded that such a correlation ($M_0 = 4$ and 6, Fig. 6 of Ref. 2) indicated that free interaction existed for their surface pressure data.

Lewis, Kubota, and Lees[2] correlation is, in fact, substantial evidence of free interaction. The correlation variables contain only local pressure, distance from the beginning of interaction, flow properties at the beginning of interaction, and wall-to-freestream temperature ratio. No reattachment conditions appear. Thus, the surface pressures and, hence, the flows over the region of separation interaction are shown to be directly dependent upon the conditions at the beginning

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