TABLE III. Values of experimental parameters for 2024–T351 aluminum.

Parameters	Low-velocity flying plates	High-velocity flying plates
Flyer plate velocity (cm/μsec)	0.125	0.33
Peak stress (Mbar)	0.110	0.345
Sound speed, c (cm/μsec)[a]	0.80±0.02	0.93±0.05
Sound speed, c (cm/μsec)[b]	0.81	...
G (Mbar)	0.54±0.07	0.59±0.25
K (Mbar)	1.27	2.28
$\sigma_e-\sigma_f$ (Mbar)	0.025	0.065
Y_e+Y_f (Mbar)	0.013±0.008	0.025±0.008
Coordinate of point M, Fig. 2	5.5	4.5
Flyer plate thickness (cm)	0.32 (nominal)	0.32 (nominal)

[a] Aluminum free-surface velocity vs depth measurements. [b] Immersed-foil water-gauge measurement.

Eq. (6)]. From Eq. (5) the elastic sound speed is

$$c^2=d\sigma/d\rho=V(K+4G/3)=FV, \qquad (12)$$

where F is called the longitudinal elastic modulus and V is the specific volume. Experiments with flyer plates give values of both c and V, so that F may be calculated. The dependence of F on the stress can be determined if experimental data are available at two or more stress levels. Replacing K with $-VdP/dV$ there results

$$G=3(F-K)/4=3(\rho c^2+VdP/dV)/4. \qquad (13)$$

The quantity dP/dV must first be approximated by $d\sigma_H/dV$ where σ_H is on the upper, or Hugoniot, curve of Fig. 6. Then the variables G, F, and K can be evaluated by using experimentally related values of V and c.

Equation (10) now becomes

$$\sigma_e-\sigma_f=(Y_e+Y_f)(K+\tfrac{4}{3}G)/2G, \qquad (14)$$

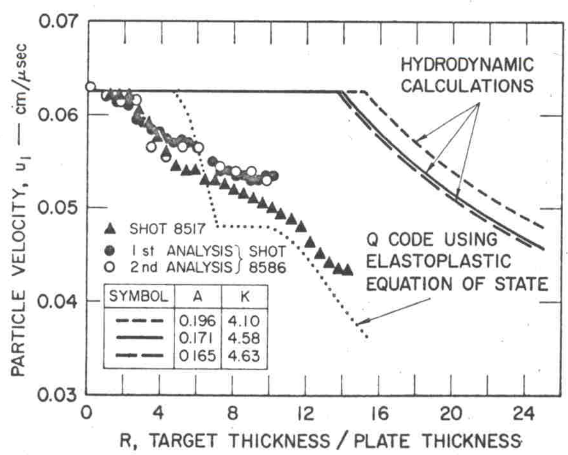

FIG. 9. Peak particle velocity in aluminum target hit by an aluminum projectile.

or by use of Eq. (12)

$$Y_e+Y_f=1.5[1-(K/\rho c^2)](\sigma_e-\sigma_f), \qquad (15)$$

where K can be approximated as explained above. It was expected that the experiments which give V and c for an elastic wave would also give, at least approximately, values of $(\sigma_e-\sigma_f)$, so that the value of (Y_e+Y_f) could be calculated. Once these values are known as, say, functions of the volume, Eq. (3) can be used to construct a tentative hydrostat, so that another approximation can be made for dP/dV, and the process of calculating G and (Y_e+Y_f) can be repeated. Because the experiments fail to show a definite separation

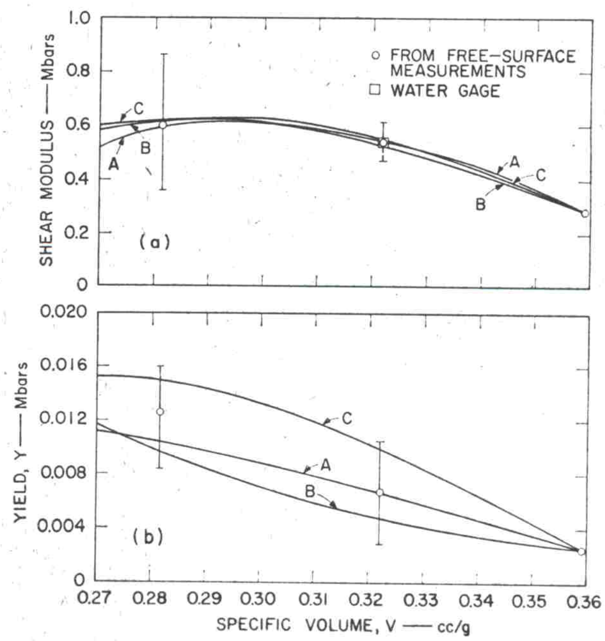

FIG. 10. Shear modulus G and yield stress Y vs specific volume V.