Table II

SUMMARY OF EXPERIMENTAL DATA

SHOT NO.	EXPLOSIVE SYSTEM	ORIENTATION	PELLET THICKNESS (mm)	ARRIVAL TIMES		FREE-SURFACE VELOCITIES		FIRST SHOCK					SECOND SHOCK				
				$t_1 - t_0$ (μs)	$t_2 - t_0$ (μs)	u_{f_1} (mm/μs)	u_{f_2} (mm/μs)	Shock Velocity U_1 (mm/μs)	Particle Velocity u_1 (mm/μs)	Stress σ_1 (kb)	$\frac{V_1}{V_0}$	Internal Energy $E_1 - E_0$ (cal/gm)	Shock Velocity U_2 (mm/μs)	Particle Velocity u_2 (mm/μs)	Stress σ_2 (kb)	$\frac{V_2}{V_0}$	Internal Energy $E_2 - E_0$ (cal/gm)
5648	P-40 lens	X (-) to (+)	6.378	1.057	1.296	0.692	1.62	6.03	0.346	55.5	0.9426	14.3	5.05	0.810	117.0	0.8395	86.6
		X (-) to (+)	6.388	1.075	1.308	0.807	1.62	5.94	0.403	63.7	0.9320	19.5	5.03	0.810	117.4	0.8500	86.4
5807	P-40	X (+) to (-)	6.388	1.079	1.320	0.836	1.52	5.92	0.418	65.7	0.9294	20.9	4.99	0.758	110.1	0.8503	75.6
		Z	6.383	0.876		1.02		7.28	0.508	98.4	0.9302	30.9	not observed				
5880	P-40	X (+) to (-)	6.391	1.078	1.322	0.754	(1.66)	5.93	0.377	59.4	0.9364	17.0	4.97	(0.828)	118.1	0.8444	90.5
	Initial state in Al					1.47											
5921	P-40 + 1" Comp B	X (+) to (-)	6.380	1.079	1.146	(0.786)	2.630	5.91	0.393	(61.8)	(0.9335)	18.5	5.61	1.315	198.8	0.7686	212.0
		Y	6.347	1.020	1.144	0.994	2.56	6.22	0.497	82.2	0.9201	29.6	5.66	1.281	199.0	0.7803	206.6
5920	P-40 + 1" Comp B	X (-) to (+)	6.391	1.069	1.139	(0.687)	2.63	5.98	0.344	(54.6)	(0.9426)	14.1	5.65	1.315	199.9	0.7702	211.7
		Z	6.380	0.876		1.40		7.28	0.698	135.1	0.9041	58.3	not observed				
6009	P-40	Y	6.358	1.058	1.363	0.819	1.43	6.01	0.410	65.3	0.9320	20.0	4.85	0.713	103.7	0.8534	68.4
		Z	6.388	0.893		1.12		7.15	0.560	106.6	0.9215	38.2	not observed				
5997	P-40 + 2" Comp B	Y	6.360	1.011	1.158	1.03	3.00	6.29	0.515	86.2	0.9180	58.5	5.62	1.50	231.9	0.7411	311.9
		Z	6.386	0.871	1.201	1.40	(2.63)	7.33	0.700	136.1	0.9046	34.0	5.70	(1.32)	(227.2)	(0.7924)	217.6
7363	P-40	Z	6.599	0.914	1.824	1.04	1.58	7.22	0.520	99.8	0.9280	32.4	4.14	0.79	127.4	0.8598	102.2
		Z	3.396	0.469	0.958	1.09	1.65	7.24	0.545	104.8	0.9247	35.5	4.10	0.82	133.4	0.8519	113.6
7394	P-40 + 1" Comp B	Z	6.607	0.899	1.336	1.27	2.32	7.35	0.635	123.6	0.9139	47.9	5.36	1.16	195.8	0.8124	193.9
		Z	3.411	0.462	0.681	1.51	2.47	7.38	0.751	147.6	0.8981	67.7	5.49	1.23	215.3	0.8066	217.2
7395	P-40	Y	6.601	1.088	1.448	0.836	1.60	6.07	0.418	67.7	0.9308	22.2	4.77	0.800	114.9	0.8495	85.3
		Y	3.399	0.562	0.745	0.862	1.58	6.05	0.431	69.3	0.9287	22.2	4.77	0.790	113.9	0.8519	85.5

Initial density, $\rho_0 = 2.657$ gm/cm^3

( ) points in parentheses are less reliable

The free-surface velocities were calculated from the measured slopes of the traces by means of the relation:

$$u_f = \frac{\tan \alpha'}{MF \tan \gamma'} \qquad (2.12)$$

where α' is the effective angle of the inclined mirror with respect to the quartz surface, γ' is the angle of the trace on the film with respect to the space axis, M is the magnification or ratio of distance on the film to the corresponding distance on the shot, and F is the writing speed of the camera. The parameters, α', and γ', of this relation are not identical to their nominal values, α and γ because of tilt of the incident shock and slight departures from orthogonality of the slit and sweep directions. The corrections are given by

$$\tan \alpha' = \tan \alpha \, (1 + \theta'/\tan \gamma)$$

and

$$\tan \gamma' = \tan \gamma \sec \delta \, (1 - \tan \gamma \tan \delta)$$

where α is the angle of the inclined mirror with respect to the quartz surface, θ' is the angle of shock tilt as measured on the film, δ is the angle of the slit with respect to the normal to the sweep direction, and γ is the angle of the trace with respect to the slit direction (Fig. 2.5).

The observed shock wave velocities and associated free-surface velocities are given in Table II, along with the initial conditions for each experiment and other quantities derived from the measured velocities.

The experimental precision, based on assembly tolerances, camera resolution, and film reading errors is estimated to be ±1% in shock velocity and ±5% in free-surface velocity. Most of the error in free-surface velocity is due to uncertainty in reading the angle γ'(± 1°).