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AUTHORITY

AFRPL ltr, 27 Oct 1971

AFRPL-TR-68-92

URS 652-35

LIQUID PROPELLANT EXPLOSIVE HAZARDS

Final Report - December 1968

VOLUME 2 - TEST DATA

PREPARED UNDER CONTRACT AF 04 (611) 10739

FOR

AIR FORCE ROCKET PROPULSION LABORATORY

AIR FORCE SYSTEMS COMMAND

UNITED STATES AIR FORCE

EDWARDS, CALIFORNIA

URS SYSTEMS CORPORATION

AFRPL-TR-68-92

URS 652-35

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Final Report - December 1968

VOLUME 2 - TEST DATA

by

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This report has been reviewed and approved.

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LIQUID PROPELLANT EXPLOSIVE HAZARDS

Volume 2

TEST DATA

Foreword

This is Volume 2 of a 3 volume report which presents the results from Project PYRO, a NASA/USAF liquid propellant explosive hazards program which was conducted at the Air Force Rocket Propulsion Laboratory (AFRPL). The objective of this program was to develop a reliable philosophy for predicting the credible damage potential which may be experienced from the accidental explosion of liquid propellants during the launch or test operation of military missiles or space vehicles.

Presented in this volume is the tabulated blast, thermal and fragmentation data from this program. Volume 1 of this report is the comprehensive technical documentary report on the entire program and Volume 3 presents a generalized method for predicting the blast environment resulting from liquid propellant explosions.

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3	S-IV FRAGMENTATION DATA	3-1

Section 1
BLAST DATA

The blast data from all the valid tests conducted during Project PYRO are presented in this section of the report.

The tests are organized as to propellant type and then test condition as follows:

Group 1 - Hypergolic High-Velocity-Impact Tests

Group 2 - Hypergolic (AFRPL) Tests

Group 3 - LO_2/RP-1 Confinement-by-the-Missile Tests

Group 4 - LO_2/RP-1 Confinement-by-the-Ground-Surface Vertical Tests

Group 5 - LO_2/RP-1 Confinement-by-the-Ground-Surface Horizontal Tests

Group 6 - LO_2/RP-1 High-Velocity-Impact Tests

Group 7 - LO_2/LH_2 Confinement-by-the-Missile Tests

Group 8 - LO_2/LH_2 Confinement-by-the-Ground-Surface Vertical Tests

Group 9 - LO_2/LH_2 Confinement-by-the-Ground-Surface Horizontal Tests

Group 10 - LO_2/LH_2 Special Tests

Group 11 - LO_2/LH_2 and LO_2/RP-1 Combined Special Tests

Group 12 - Close-in Blast Data

At the beginning of each group a summary page has been inserted. This summary includes pertinent information about the tests including: length-to-diameter ratio (L/D); diaphragm opening diameter to tank diameter ratio $\left(D_o/D_t\right)$; propellant weight; terminal yield; ignition time; velocity range; and propellant orientation. The data are presented in the same order as on the summary sheet.

Brief explanations for the various terms which are used in the tables and figures to follow are presented below. For a more complete description, refer to Volume 1 of the report.

Test Conditions

- High-Velocity-Impact – tests in which the propellant tank was propelled along a horizontal track by a solid-fuel rocket and allowed to impact on a target.
- Explosive Donor – tests in which an explosive was used to aid the mixing of the propellant combination.
- Confinement-by-the-Missile (CBM) – tests in which a diaphragm between fuel and oxidizer tanks was ruptured, and all mixing took place within the propellant tank.
- Confinement-by-the-Ground-Surface (CBGS) – tests in which the spread and mixing of the propellant combination occurs on the surface of the ground. Two categories within this mode were examined in the course of the project. They were:
  a. Vertical (V), in which both oxidizer and fuel were released at nearly the same time and velocity.
  b. Horizontal (H), in which oxidizer and fuel are released at different times and velocities.

Velocity Range

Refers to the impact velocity of both propellants in the vertical tests and the top propellant in the horizontal tests from the CBGS test series. Values given are theoretical values computed from the drop height of the test tank. (The height in most cases was measured from the diaphragm on the upper propellant compartment to the ground surface.) The velocity ranges used were as follows:

Low Drop	~ 23 ft/sec
Medium Drop	~ 44 ft/sec
High Drop	~ 78 ft/sec
High Velocity Impact	~ 600 ft/sec

The bottom propellant in the horizontal tests was always dropped from the lowest practical height resulting in an impact velocity of ~12 ft/sec.

Propellant Orientation

Two orientations were used, normal and reversed, with normal being the orientation commonly used in present vehicle systems (i.e., for the LO_2/RP-1 propellant combination LO_2 was in the top tank compartment and RP-1 in the bottom; for the LO_2/LH_2 propellant combinations LH_2 was in the top compartment and LO_2 in the bottom).

D_o/D_t

The ratio of the opening in the tank diaphragm to the tank diameter.

L/D

The length-to-diameter ratio of the propellant masses.

Station Number

These numbers are coded to indicate the type of measurement (first digit), the gauge line (second digit), and nominal distance (third digit). The key is as follows:

FIRST DIGIT (TYPE OF MEASUREMENT)	SECOND DIGIT (GAUGE LINE) (deg)	THIRD DIGIT (NOMINAL DISTANCE) (ft)
1 - Side-on Pressure	1 - 299*	5 - 23
2 - Stagnation Pressure	2 - 59*	6 - 37
	3 - 179*	7 - 67
	4 - 30**	8 - 117
	5 - 60**	9 - 200
	6 - 90**	0 - 335
	7 - 180**	1 - 600

* Designated by compass heading measured from ground zero (AFRPL test site).

** Designated in degrees azimuth from sled track (Naval Weapons Center test site).

Trace Characteristics

Each of the data traces received during this program has been categorized as to shape and baseline characteristics using the categories given below. Tracings of actual analog records illustrating each characteristic shape are given in Figs. 1-1 through 1-6.

TRACE CHARACTERISTICS

Shape

Type 1 - Classical. This trace shows a vertical rise to maximum pressure, followed by a modified exponential decay. For pressure-time measurements taken at a relatively large distance from the source of the shock, the decay will be a fair approximation to a straight line, as shown.

Type 2 - Noisy. The type of noise indicated here occurs simultaneously on a number of traces, and appears due to a fault which is common to a number of gauge systems. It cannot be differentiated from Type 3 without reference to other traces in the run in question.

Type 3 - Noisy. This type of noise occurs only on a single trace, with no observable correlation with other traces. It may reflect real blast phenomena, or a fault unique to the individual gauge system, but in either case, prevents completely satisfactory comparison with classical traces.

Type 4 - Multiple Peaks. Clearly differentiable from each other in time.

Type 5 - Flattened Peak. In this type of trace, the exponential decay of the classical trace is delayed for some time after the peak is reached.

Type 6 - Off-Band Edge. If the peak overpressure exceeds the capability of a given gauge system, an abrupt limiting action results, chopping off that part of the peak which exceeds system capabilities.

Type 7 - Spiky Peaks. These are narrow, sharp peaks which may occur in multiples, and often are the result of the pressure transducer's being inside the explosion region.

Type 8 - Humped Trace. In this type of trace, after the "instantaneous" rise caused by the initial shock, pressure continues to rise more or less linearly with time to some higher value before decaying.

Type 9 - Rounded Peak. Here there is no sharp break with the vertical rise given by the initial shock, but maximum pressure is not reached instantaneously, and as a result, the peak may be missed by an unknown factor.

Type 10 - Step in Pressure Rise. This may be caused by a secondary peak about to "catch up" to a primary peak, or by some flaw in the gauge mounting. In the latter case, pressure measurements may be thrown seriously in doubt.

Type 11 - Poor Rise Time. The relatively slow pressure rise may cause the gauge to miss the peak.

Type 12 - Overshoot. This characteristic may reflect either a real condition or a gauge malfunction. Examination of other traces in the same run may indicate which, but the magnitude of uncertainty with respect to pressure is greater when overshoot is evident than when it is not.

Baseline

The three baseline characteristics are:

Type 1 - Flat and essentially noise free

Type 2 - Noisy

Type 3 - Drift

Many of these characteristics, both "Baseline" and "Trace," may combine in any one trace. Where this is so, multiple type numbers have been given to show this fact. Type numbers in parentheses indicate an effect that is observable, but apparently of secondary significance. It may be difficult to separate "Baseline" and "Trace" characteristics in certain cases, in which case the characteristic (e.g., "Noise") may be assigned to both.

Remarks

In the course of assembling the data bank, it was found necessary to explain some characteristics of these data in more detail. Accordingly, the following table of remarks was established, with numbers in the "Remarks" section of the data bank corresponding to the numbers below:

1. Calibration drift.

2. Suspiciously weak compared to other traces, indicating an unknown degree of attenuation of the signal possibly caused by incorrect amplifier gain setting or miscalibration of the gauge system. This remark was added in cases where the station showed half of the yield or less of its neighbors, both in the same gauge line and at the same nominal distances.

3. Cycling – a large amplitude sixty-cycle noise superimposed on the trace.

4. 13 percent subtracted from calibration pressure as a result of change in gauge calibration.

5. Breaks into oscillation at shock arrival.

6. Baseline drift tends to increase impulse.

7. Baseline drift tends to decrease impulse.

8. Bad timing.

9. No trace or no deflection.

10. Bad or questionable calibration.

11. Questionable input data.

12. Highest of multiple peaks calculated.

13. Trace arrives significantly earlier than others at the same nominal distance.

14. Trace arrives significantly later than others at the same nominal distance.

15. Deflection too small to measure accurately.

16. Questionable return to zero due to length of trace.

Percent Yield

All yield values are expressed relative to a hemispherical charge of TNT on the ground surface. The curve given in Ref. 1 was used for peak overpressure and that in Ref. 2 for positive-phase impulse.

Ignition Time

CBM Tests – the measured time from ignition of the charge which activates the diaphragm break mechanism to detonation (obtained from the motion picture films).

CBGS Vertical Flow Condition – the measured time from impact of the fluid on the ground surface to detonation.

CBGS Horizontal Flow Condition – the measured time from impact of first fluid to impact of second fluid, and the measured time from impact of the second fluid on the ground surface to detonation.

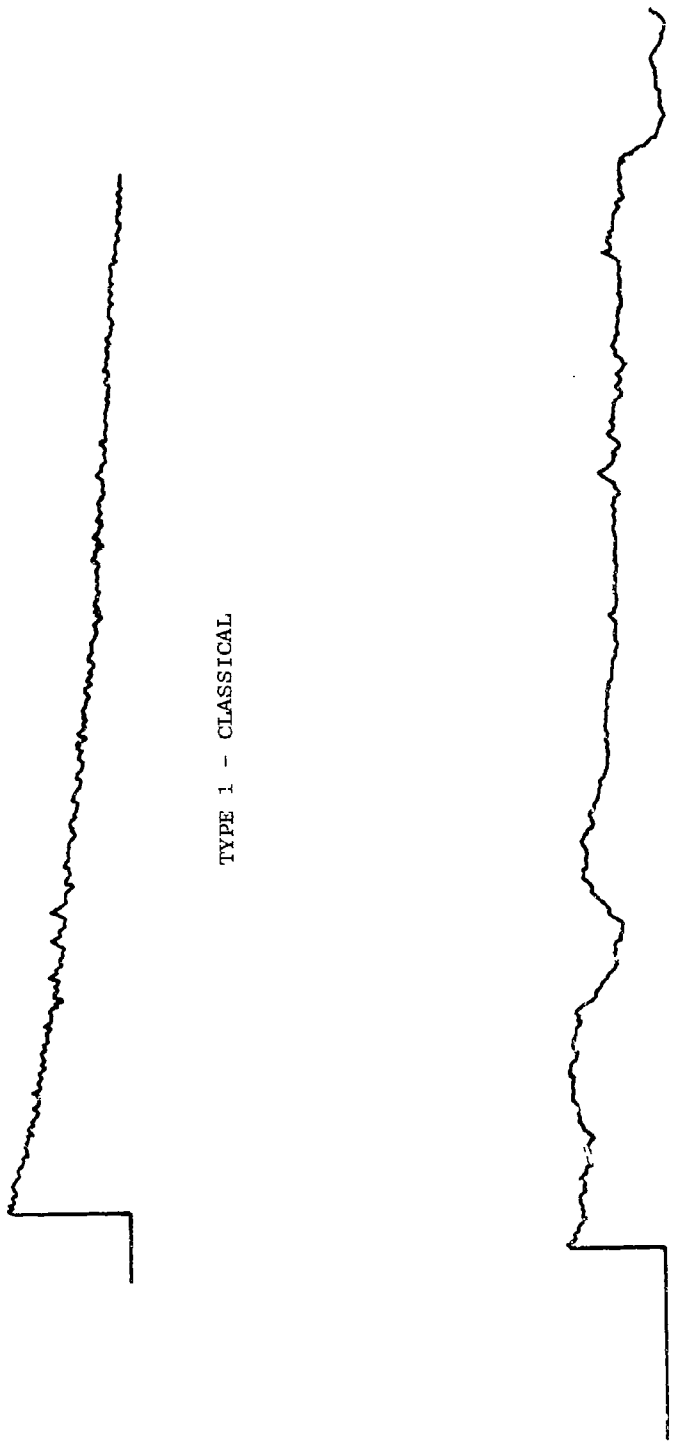
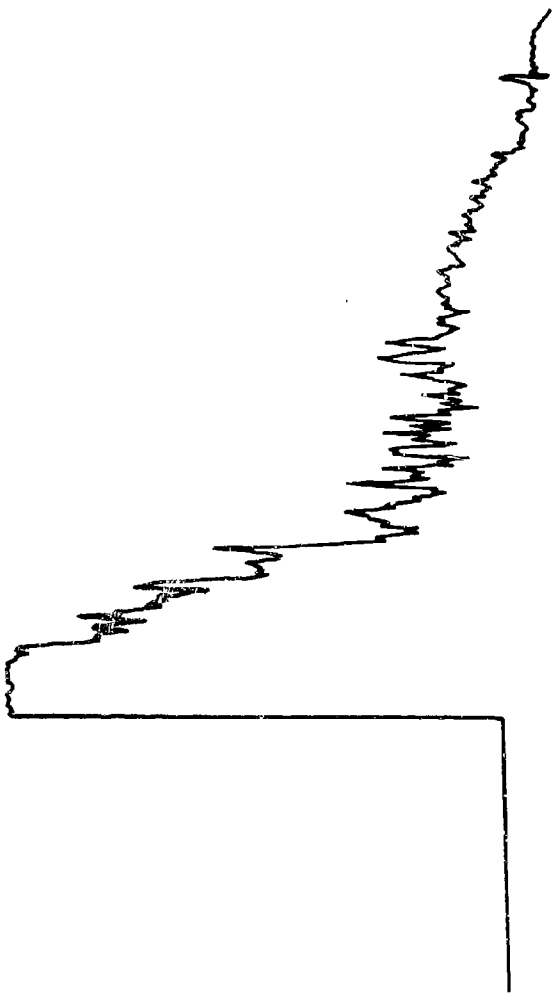


Fig. 1-1. Trace Types

TYPE 4 - MULTIPLE PEAKS

TYPE 5 - FLATTENED PEAK

Fig. 1-2. Trace Types



TYPE 6 - OFF-BAND EDGE

TYPE 7 - SPIKY PEAKS

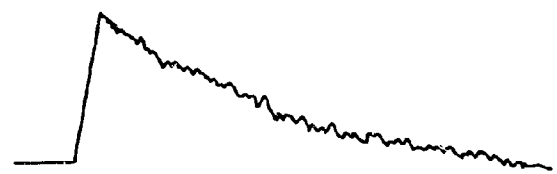
Fig. 1-3. Trace Types

TYPE 8 - HUMPED TRACE

TYPE 9 - ROUNDED PEAK

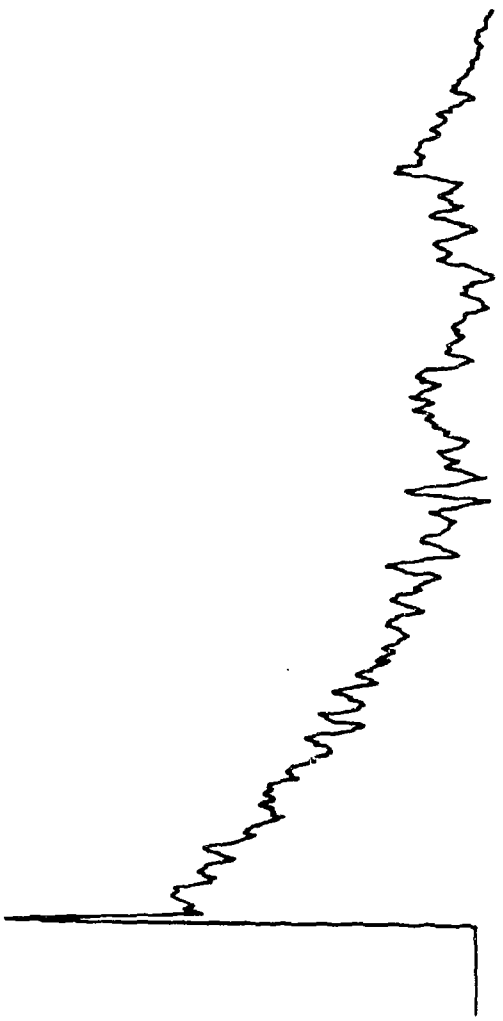
Fig. 1-4. Trace Types

TYPE 10 - STEP IN PRESSURE RISE



TYPE 11 - POOR RISE TIME

Fig. 1-5. Trace Types



TYPE 12 - OVERSHOOT

Fig. 1-6. Trace Type

REFERENCES

1. Kingery, C. N. and B. F. Pannill, Peak Overpressure vs Scaled Distances for TNT Surface Bursts (Hemispherical Charges), BRL Memorandum Report No. 1518, Ballistic Research Laboratories, April 1964 (AD 443 102).

2. Operation SNOW BALL Project Descriptions, Volume 1 (U), DASA Data Center Special Report 24-1, DASA 1516-1 (AD 441 974).

GROUP 1

HYPERGOLIC HIGH-VELOCITY-IMPACT TESTS

TARGET TYPE	PROPELLANT WEIGHT (lb)	VELOCITY	TEST NO.	TERMINAL YIELD (%)
Flat Wall	200	340	007	5
		570	001	13
		566	068	15
	1000	410	073	21
		570	012	15
		585	072	23
Shallow Hole	200	575	002	53
Deep Hole	200	340	008	38
		575	003	24
		500	009	56
		555	069	37
	1000	570	013	28
		557	074	34
Parallel Wall	200	340	004	33
		340	010	21

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Flat Wall

TEST NO. 007 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	7.8	2.2	No data		1(12)	1	
155	6.9	2.0	19.1	6.0	12.5	2	
-	-	-	-	-	-	-	
146	2.9	2.0	15.4	8.3	5	1	
156	No data		No data		4	1	
-	-	-	-	-	-	-	
147	1.7	3.7	7.3	6.3	1	3	
157	No gauge		No gauge				9
-	-	-	-	-	-	-	
148	1.1	6.	5.2	7.2	8	1	
158	No gauge		No gauge				9
-							
149							9
159							9
-							

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Flat Wall

TEST NO. 001 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	14.9	7.8	43.5	24	5, 7	1	
155	"	-	-	-	4	1	
-	-	-	-	-	-	-	
146	7.6	13	22.3	17	1 (12,5)	1	
156	8.2	12	22.0	16	12	1(3)	
-							
147							9
157							9
-							
148							9
158							9
-							
149							9
159							9
-							

TEST NO. 068 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	18.5	6.8	60.2	35	10,12(4)	1	
165	-	-	-	-	-	-	9
175	-	-	-	-	-	-	9
146	8.8	12	32.9	25	12	1	
166	4.8	6.6	21.8	15	12	1	
176	-	-	-	-	-	-	9
147	2.8	12	13.2	15	12	1	
167	2.3	7.9	12.4	14	12	1	
177	4.6	39	21.0	31	12	1	
148	1.6	18	7.7	14	12, 3	1	
168	1.2	9.1	9.6	21	5	1	
178	0.7	1.9	3.7	4.5	~1	1	
149	-	-	-	-	-	-	9
169	-	-	-	-	-	-	9
179	0.8	16	5.5	18	5	1	

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Flat Wall

TEST NO. 073 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	20.3	11	101	39	1	1	
166	10.1	5.1	56.5	16	12, 5	1	
176							9
147	7.8	17	47.7	28	12	1	
167	5.8	10	34.1	16	12	1	
177	3.9	5.2	33.0	14	4	1	
148	3.2	19	25.0	23	12	1	
168	2.7	14	21.8	18	12	1	
178	2.4	11	20.0	16	1	1	
149	1.8	33	16.2	26	1	1	
169	1.2	13	13.0	17	3	1	
179	1.2	12	12.3	15	8	1	

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Flat Wall

TEST NO. 012 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	No gauge						9
155	No gauge						9
-							
146	21.0	11	101	39	12	1	
156	13.5	3.8	71.3	21	5	1	
-							
147	7.7	17	53.5	22	1	1	
157	No useful data				12.5	1	
-							
148	3.7	22	32.3	30	1	3	
158	No gauge						9
-							
149	1.5	16	16.9	22	1(3)	2	
159	No gauge						
-							

TEST NO. 072 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	28.4	14	108	40	12	1	
166	10.7	5.0	59.2	18	12	1	
176							9
147	9.9	23	51.5	31	12	1	
167	5.7	9.5	35.3	17	12	1	
177	5.1	8.7	31.3	14	12	1	
148	2.6	13	19.9	15	12	1	
168	2.1	8.2	17.8	13	12	1	
178	2.6	13	18.6	12	1	1	
149	1.7	30	18.1	26	3	1	
169	1.2	12	13.8	19	1	1	
179	1.3	15	11.3	14	1	1	

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Shallow Hole

TEST NO. 002 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	38.8	26	105	149	7	1	
155	-	-	-	-	4	1	
-	-	-	-	-	-	-	
146	19.0	44	54.2	67	1 (12)	1	
156							9
-							
147							9
157							9
-							
148							9
158							9
-							
149							9
159							9
-							

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Deep Hole

TEST NO. 008 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	28.0	14	120	110	12,5,3	1	
155	12.8	5.5	25.2	9.3	12	1	
-							
146	12.0	22	87.9	150	8,3 or 4	1	
156	No data				1	1	
-							
147	6.1	49	36.3	76	4	1	
157							9
-							
148	2.7	56	19.8	64	4 or 8	1	
158							9
-							
149							9
159							9
-							

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Deep Hole

TEST NO. 003 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	12.7	9.0	39.9	24	12	1	
155	13.2	8.4	33.1	17	10	1	
-							
146	6.3	13	34.8	38	12	1	
156	6.8	13	29.7	27	12	1	
-							
147					3	1	
157							9
-							
148	1.8	17	12.4	33	1	1	
158							9
-							
149							9
159							9
-							

TEST NO. 009 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	33.6	23	108	120	3	1(3)	
155	19.2	11	31.4	14	12	1	
-							
146	19.8	51	80.6	130	3	1(3)	
156	No useful data				1	1	
-							
147	8.8	98	37.0	82	1	1	
157							9
-							
148	3.3	89	23.6	39	1	3	
-							
149							9
159							9
-							

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Deep Hole

TEST NO. 069 PROPELLANT WT. 200 LE

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	53.5	26	121	85	3	1	
165							9
175							9
146	18.1	24	74.9	75	12	1	
166	5.8	8.2	21.6	13	12	1	
176							9
147	5.0	32	1.2	65	12	1	
167	2.9	11	14.4	15	12	1	
177	1.7	3.5	12.7	13	12,4	1	
148	2.5	12	20.9	58	12,3	1	
168	1.6	14	10.4	20	4	1	
178	1.0	4.9	8.0	28	4	1	
149							9
169							9
179	0.5	4.5	5.7	17	4,8	1	

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Deep Hole

TEST NO. 013 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
155							9
-							
146	27.2	16	140	64	12,4	1	
156	21.0	10	111	39	5	1	
-							
147	14.7	41	76.4	46	1	1	
157					12,8	1	
-							
148	5.8	51	48.5	46	1	1(3)	
158							9
-							
149	1.9	28	24.5	32	3,4	1,3	
159							9
-							

TEST NO. 074 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	58.8	28	215	110	12,3	1	
166	10.4	4.7	70.7	23	4	1	
176							9
147	15.8	43	131	130	12	1	
167	7.4	16	52.3	31	12,4	1	
177	2.9	3.2	25.9	11	1	1	2
148	6	60	56.4	79	~1	1	
168	3.2	20	35.0	39	12,4	1	
178	2.4	12	24.8	22	1	1	
149	2.6	47	22.1	11	3	1	
169	1.6	24	23.3	42	4,3	1	
179	0.7	4.4	8.2	7.9	1	1	

N_2O_4/50-50 HYPERGOLIC HIGH VELOCITY

Parallel Wall

TEST NO. 004 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	18.3	17	63.9	59	12,5	1	
155	13.7	10	56.7	46	12,4	1,3	
-							
146	9.4	26	44.1	57	12	1,3	
156	7.3	15	37.7	41	8	1,3	
-							
147	4.1	30	24.3	46	12	1	
157							9
-							
148	2.2	41	14.7	43	1	1	
158							9
-							
149							9
159							9
-							

TEST NO. 010 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145	16.4	9.9	54.8	38	12	1	
155	13.2	7.2	44.3	26	12		
-							
146	7.6	15	39.4	42	12,3	1	
156					5	1	
-							
147	3.0	24	19.8	32	12	1	
157							9
-							
148	1.6	19	11.6	30	10	3	
158							9
-							
149							9
159							9
-							

GROUP 2

HYPERGOLIC (AFRPL) TESTS

L/D	TEST TYPE*	VELOCITY OR (D_o/D_t)	TEST NO.	TERMINAL YIELD (%)
1.8	CBM	(0.45)	031	0.2
			032	0.1
			035	0.2
	30-lb Spherical Donor	(0.45)	019	3.4
			030	4.0
	1-lb Conical Donor	(0.45)	028	1.2
			029	0.8
	Command Destruct	(0.45)	025	0.4
			036	0.3
	Cold Propellant	(0.45)	033	8.8
			037	13.7
	Tower Drop	77 ft/sec	157	0.3
			158	0.2
			159	0.3
	1000-lb Tower Drop	77 ft/sec	189	0.4
			257	0.3
			258	0.3

* Unless otherwise noted all tests were 200-lb propellant weight.

N_2O_4/50-50 HYPERGOLIC

Confinement-by-the-Missile

TEST NO. 031 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	0.9		2.2		~ 1	1	
125	0.8	0.1	1.9	0.3	8	2	
135	1.0		2.4		1	~ 1	
116	0.6		1.7		8,3	2	
126	-	0.1	1.1	0.3	4,8	2	
136	0.6		1.5		11	2	
117	0.3		0.8		8	2	
127	-	0.1	-	0.3	11,8	2	
137	0.3		0.8		11	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 032 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115			0.8		11,4	1	
125	0.9	0.04	0.6	0.1	12	1	
135	1.0		-		12,5	1	
116	-		-		3	1	
126	0.6	0.1	0.5	0.1	3	1	
136	0.7		0.6		1(3)	2	
117	0.3		0.3		3	1	
127	-	0.1	-	0.1			9
137	0.3		0.3		11,3	1	
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 HYPERGOLIC

Confinement-by-the-Missile

TEST NO. 035 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	1.0		0.9		1(4)	2	
125	1.2	0.1	1.1	0.1	1(3 or 4)	2	
135	-		-				9
116	0.8		0.8		12,3	1	
126	0.8	0.2	0.8	0.1	3	1	
136	0.8		0.9		1	2	
117	0.4		0.5		1(3)	2 or 3	
127	-	0.2	-	0.1	1	1	
137	-		-				9
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 HYPERGOLIC

30-lb Spherical Donor

TEST NO. 019 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.4		43.6		1	1	
125	22.4	3.3	43.5	8.6	12	1	
135	20.0		38.3		12	1	
116	-		-		No Data	1	9
126	8.8	1.2		6.8	3	1	
136	6.6		28.3		3,5	1	
117	3.5		17.5		5,4,3	1	
127	2.9	-2.3	17.6	8.2	1	1	
137	3.6		19.0		5,4	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 030 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.5		34.8		12	1	
125	22.0	3.5	32.0	0.8	12,4	1	
135	20.5		33.4		12	1	
116	8.5		29.7		1,3	2	
126	8.5	2.1	36.5	12	1(4)	1	
136	7.3		30.5		1,(4),3	1	
117	3.4		17.0		5,4,3	1	
127	-	-6.8	-	5.5	1,(3,4)	1	
137	3.0		16.5		5,4	1	
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 HYPERGOLIC

1-lb Conical Donor

TEST NO. 028 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	4.2		11		4	2	
125	-	0.7	-	1.3	-	-	9
135	-		-		4	2	
116	1.8		5.5		4,3	2	
126	2.0	0.6	4.0	1.2	4	2	
136	-		-		-	-	9
117	0.9		3.4		4	1	
127	-	0.8	-	1.3	12	2,(3)	
137	1.0		2.8		4	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 029 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	4.3		10.3		12	1	
125	3.6	0.5	6.3	1.0	12	2	
135	3.2		6.0		1	1	
116	1.7		5.0		3		
126	1.7	0.3	3.5	0.9	1	1	
136	-		-		-	-	9
117	0.8		3.0		3	1	
127	-	0.7	-	1.6	3	2	
137	1.0		2.9		1	1	
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 HYPERGOLIC

Command Destruct

TEST NO. 025 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	1.5		3.1		3	2	
125	1.4	0.1	2.3	0.3	10,8	2	
135	0.9		1.9		10,3	2	
116	0.9		1.5		8	1	
126	0.8	0.1	1.5	0.3	11	1	
136	0.6		1.4		10	2	
117	0.6		1.0		11,8	~ 1	
127	-	0.3	-	0.4	1	1	2
137	0.4		0.9		~ 1	~ 1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 036 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	1.1		2.1		1(3)	2	
125	1.1	0.1	2.0	0.2	12	2	
135					3,8,4	2	
116	0.8		1.5		1,(3,12)	2	
126	0.7	0.1	1.3	0.3	3	2	
136					12,4,8	2	
117	0.4		0.9		10	2	
127	-	0.3	-	0.4	1	2	
137	-		-				9
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 HYPERGOLIC

Cold Propellant

TEST NO. 033 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-		-				9
125	9.6	2.8	25.8	10	12	1	
135	6.5		24.8		3,7	2	
116	-		-				9
126	3.8	4.9	14.9	9.8	12,3	1	
136	3.8		17.4		4	1	
117	1.8		9.4		3	1	
127	-	6.1	-	12	3	1	
137	1.7		9.8		1(3)	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 037 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	28.5		41.6		12	1	
125	16.0	2.7	28.9	1.1	3,4	1	
135	20.0		30.3		4	1	
116	17.2		44.4		3	1	
126	6.7	13	32.3	15	3,4	1	
136	8.2		29.5		1	1	
117	3.7		15.4		3	1	
127	-		-				9
137	-		-				9
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 V HYPERGOLIC

Tower Drop High-Velocity

TEST NO. 157 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	1.6	0.2	-	-	9	1	
125	-	-	-	-	-	-	9
135	1.7	0.2	3.4	0.5	1	1	
116	0.8	0.2	1.8	0.4	1	1	
126	0.9	0.2	1.8	0.4	1	1	
136	0.9	0.2	2.0	0.4	1	1	
117	0.4	0.2	-	-	8(9)	1	
127	0.3	0.2	1.0	0.5	9	1	
137	0.4	0.2	1.0	0.5	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 158 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	1.3	0.1	2.1	0.2	4(5)	1	
125	1.2	0.1	2.0	0.2	10(4)	1	
135	1.5	0.1	2.6	0.3	1	1	
116	0.7	0.1	1.5	0.3	1(5)	1	
126	0.7	0.1	1.3	0.3	1	1	
136	0.7	0.1	1.6	0.4	1	1	
117	-	-	0.7	0.3	10	1	
127	-	-	0.7	0.3	5	1	
137	0.4	0.2	0.8	0.3	5	1	4
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 V HYPERGOLIC

Tower Drop High-Velocity

TEST NO. 159 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	11,12	1	
125	1.5	0.2	3.6	0.5	10	1	
135	1.4	0.1	3.4	0.5	1	1	
116	-	-	-	-	11,12	1	
126	0.8	0.2	1.9	0.4	1	1	
136	0.7	0.1	1.9	0.4	4	1	
117	0.4	0.2	1.0	0.5	8	1	
127	0.4	0.2	1.1	0.5	4(5,8)	1	
137	0.4	0.2	1.0	0.5	5	1	4
118							9
128							9
138							9
119							9
129							9
139							9

N_2O_4/50-50 V HYPERGOLIC

Tower Drop High-Velocity

TEST NO. 189 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	2.3	0.1	13.6	0.8	4	1	15
125	2.8	0.1	15.7	1.0	8,9	1	15
135	2.3	0.1	9.9	0.5	9	1	15
116	-	-	6.2	0.5	4(5)	1	
126	1.7	0.2	6.7	0.6	4	3	6
136	1.6	0.2	5.4	0.4	10(9)	3	
117	-	-	3.2	0.5	10,11	1(2)	
127	0.9	0.3	3.6	0.6	10,11,5	1	
137	-	-	-	-	4	3	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 257 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	3.1	0.1	13.4	0.8	1	1	
125							15
135							15
116	1.0		5.9	0.5	1(3)	1	
126	0.6	0.02	5.5	0.4	4	1	
136	0.4	0.01	4.3	0.3	4	1	
117	0.5	0.1	3.8	0.6	1	1	
127	0.5	0.1	2.5	0.3	4	1	
137	0.3	0.02					2
118	0.3	0.2	2.0	0.6	1	1	
128	0.2	0.1	1.4	0.4	4	1	
138	0.2	0.1	1.3	0.3	8	1	
119	0.1	0.1	1.6	1.0	11	2	
129	0.1	0.1	1.2	0.6	4,8	1	
139			0.9	0.4	11,8	2	

N_2O_4/50-50 V HYPERGOLIC

Tower Drop High-Velocity

TEST NO. 258 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115							15
125			1.9	0.04	11,12	2	15
135							15
116			0.9	0.03	8	2	15
126	1.0	0.1	5.0	0.4	9,11	3	
136	0.4	0.01	7.1	0.6	8	2	
117			2.5	0.3	8,11,4	2	15
127	0.6	0.1	2.4	0.3	12,11	1	
137					11,4	2	15,2
118			1.7	0.5	8,11	2	15
128	0.3	0.2	1.6	0.4	11,8	2,3	
138			1.5	0.4	11,4	1	15
119							15
129	0.2	0.3	0.6	0.2	8	1	
139			0.6	0.2	11,8	2	15

GROUP 3

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

L/D	D_o/D_t	PROPELLANT WEIGHT (lb)	TEST NO.	TERMINAL YIELD (%)	IGNITION TIME (msec)
1.8	1	200	042	48	290
			058	27	200
			086	14	100
	0.45	200	044	18	120
			087A	16	70
			095A	17	120
			101	25	145
			237	32	127
			238	19	85
			239	32	156
		Partial Full*	174	52	150
			240	60	156
	0.45	1000	192	14	216
			193	20	222
			209	10	121
			270A	13	225
	0.45	25000	275	4	515
			278	13	530
			282	13	540
5	1	200	047	4	515
			049	12	316
			085	12	380
5	0.45	200	046	17	143
			088	4	60
			100	23	220
4	0.1375	94000	301	4	840

* Tank contained ~133 lb propellant.

LO_2RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:1

TEST NO. 042 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	39.0		66.0		7(5)	1	
125	35.0	41	60.0	54	12(5)(3)	1	
135	35.0		69.0		10(12)7	1	
116	20.2		51.6		1	1	
126	19.0	66	46.2	56	5	2	
136	15.4		48.7		2(6)	2	
117	5.0		25.8		1(5)	1	
127	-	44	-	52	1	1	2
137	4.8		24.9		1(5)	2	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 058 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	29.0		45.2		12(2)	2	
125	24.0	25	47.1	27	5(2)	2	
135	25.5		39.6		12(6)	1	
116	11.6		28.9		1(2)	2	
126	11.0	30	27.7	22	12(2)	2	
136	10.0		27.7		5(2)	2	
117	4.2		13.7		5(7)	2	
127	-	31	-	24	11	2	2
137	3.8		17.8		1(2)	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:1

TEST NO. 086 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.2	16	30.5	15	1	2	
125	14.4	22	26.1	11	1	2	
135	13.5	19	23.4	9.6	1	2	
116	6.3	12	17.6	12	1	2	
126	5.1	8.4	17.0	11	1	2	
136	6.2	12	21.2	16	1	2	
117	2.4	12	10.3	13	1	2	
127	-	-	-	-	11	2	10
137	2.7	14	10.5	14	1	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 044 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.5		38.8		5(2)	2	
125	18.0	16	39.9	20	12(5)(2)	2	
135	18.0		32.2		12(5)(6)	2	
116	8.1		25.3		5(6)	2	
126	8.4	18	26.9	18	1(6)(2)	2	
136	7.3		21.2		2(5)	2	
117	3.3		13.2		2(1)	2	
127	-	18	-	17	1	2	2
137	2.8		12.3		2	2	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 087A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	14.8	11	36.2	19	5	2	
125	16.2	13	30.2	14	1	1	
135	16.9	14	34.2	18	1	2	
116	6.2	12	20.6	15	1	2	
126	6.1	11	20.4	15	1	2	
136	7.0	14	23.5	19	1	2	
117	2.7	14	12.1	17	5	2	
127	2.6	13	12.7	18	1	2	
137	2.9	17	12.4	17	1	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

$L/D:1.8, D_o/D_t:0.45$

TEST NO. 095A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	18.1	16	33.2	17	5	2	
125	17.5	15	29.2	14	1	2	
135	20.9	19	33.5	17	1(7)	2	
116	8.3	20	31.2	16	1	1	
126	7.9	18	22.8	18	1	2	
136	7.0	14	22.2	17	1	2	
117	2.9	18	11.1	15	1	1	
127	3.1	19	11.8	16	1	1	
137	3.1	19	13.1	19	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 101 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	31.4	33	60.3	44	1(5)	1	
125	25.0	25	46.4	29	1	2	
135	28.4	29	47.7	31	1	2	
116	13.3	42	38.5	42	1	2	
126	10.5	29	37.1	39	1	2	
136	9.7	25	36.1	37	1	2	
117	4.6	39	20.0	35	1	1	
127	3.8	28	18.6	31	1	2	
137	4.0	31	22.2	40	1	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 237 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	24.7	25	-	-	5(4)	2	3
125	31.0	34	49.3	33	4(5,12)	3	
135	33.4	36	51.0	35	5,5,12	2	
116	9.8	26	27.9	25	4,5	2,3	
126	8.9	21	31.6	30	5,4	2,3	
136	14.2	46	35.9	37	4	2,3	
117	3.7	27	19.5	33	5,4	2,3	
127	3.4	22	16.3	26	5(4)	2,3	
137	4.2	33	19.1	32	4	2,3	
118	1.7	28	10.8	32	5,4	2,3	
128	1.8	32	9.4	26	5(4)	2	
138	1.8	30	10.7	32	5(4)	2	
119	-	-	6.8	38	9,8	2,3	
129	0.9	30	5.5	29	10,4	2	
139	0.9	33	6.4	36	4	2,3	

TEST NO. 238 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	17.2	14	-	-	5,4,2,3	2,3	
125	12.7	18	33.7	18	5(4)	2,3	
135	18.9	16	30.1	14	10	2	
116	6.6	13	13.3	8.0	5,2,3	2,3	
126	7.4	16	18.5	13	5,12	2,3	
136	7.3	16	23.5	19	5	2,3	
117	2.6	13	12.5	17	5,5	2,3	
127	2.5	12	11.6	15	5,4	2,3	
137	3.2	20	13.6	20	9,5	2,3	
118	1.3	14	6.6	16	5,4	2,3	
128	1.4	13	7.4	18	4,5	2	
138	-	-	-	-	-	-	9
119	-	-	4.3	20	9,8	2	
129	0.7	17	4.8	24	10	2	
139	0.7	16	3.6	16	4,5	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 239 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	37.0	12	-	-	4	2,3	
125	34.6	39	59.3	45	12	2,3	
135	34.0	40	53.3	37	4,3,7	2,3	
116	9.4	25	-	-	4,3,7	2,3	
126	11.4	32	29.5	27	4,3,7	2,3	
136	11.7	34	34.7	35	4,3,7	2,3	
117	3.7	26	18.9	32	5,8	2,3	
127	3.7	26	17.2	27	4,5	2,3	
137	4.3	34	18.7	31	9	2,3	
118	1.7	25	9.2	26	5(4)	2	
128	1.9	35	9.0	25	5(4)	2	
138	1.6	23	9.6	28	5,4	2	
119	-	-	5.8	31	9,8	2	
129	0.9	35	5.6	30	10	2	
139	0.9	31	5.7	30	5,4	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45 Partial Full

TEST NO. 174 PROPELLANT WT. 200* LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	59.2	45	4(5)	1	3
125	45.2	56	61.3	48	1(4)	2	
135	47.5	59	-	-	4	2	3
116	-	-	43.8	51	6	2	
126	-	-	41.8	47	6(4)	1	
136	-	-	-	-	6(12,4)	2	3
117	5.1	47	27.0	54	10(4)	2	
127	5.7	58	26.5	56	4(5)	1	
137	5.4	53	25.2	49	10(4)	2	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 240 PROPELLANT WT. 200* LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	60.2	85	58.0	43	5,3	2,3	
125	48.4	75	61.6	48	4,12	2,3	
135	61.0	87	55.9	41	4,12	2,3	
116	17.3	63	46.3	57	4,12	2,3	
126	24.3	100	70.2	113	4,12	2,3	11
136	-	-	41.1	47	3,7	2,3	
117	5.2	51	29.5	62	5,4	2,3	
127	4.9	46	26.8	54	4,5	2,3	
137	5.4	52	27.6	51	9,8	2,3	
118	2.2	48	12.6	41	4	2,3	3
128	2.5	66	11.0	33	4,5	2,3	
138	2.2	50	14.9	52	5,4	2,3	
119	-	-	9.9	65	5,4	2,3	
129	1.2	64	9.3	60	5,4	2,3	
139	1.1	58	8.2	50	5,4	2,3	

* Calculations based on this weight. Actual propellant weight: 133 lb.

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 192 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	38	8.7	59	8.8	1(12)	2	
125	40	9.6	60	9.2	10,12	2	
135	34	7.7	60	9.1	1	2	
116	15	9.5	45	11	4	2	
126	13	8.0	40	9.1	11	2	
136	13	8.2	48	12	1	2	
117	-	-	-	-	11	2	2
127	-	-	-	-	11,8	2	2
137	5.3	10	30	13	1	2	
118	2.1	8.4	16	11	1(5)	1	
128	2.2	9.9	18	14	1(5)	2	
138	2.4	12	18	14	1(5)	2	
119							9
129							9
139							9

TEST NO. 193 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	53	14	85	17	1	2	
125	59	16	109	25	12(5)	1	
135	-	-	76	14	4(5)	1	
116	19	15	57	16	1(4)	2	
126	19	14	65	19	1	1	
136	19	15	64	19	1	1	
117	6.7	15	43	23	1(5)	2	
127	-	-	-	-	10,9,5	2	
137	7.4	18	56	34	5	2	
118	2.9	17	25	23	1(5)	1	
128	2.9	17	24	21	1(5)	1	
138	2.9	18	26	24	1(5)	1	
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 209 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	42.1	10	94.6	20	4(5)	2,3	
125	38.9	9.2	64.4	10	12,8	1	
135	40.2	9.7	58.3	8.8	4,5	1	
116	14.5	9.4	45.2	11	4,5	2,3	
126	13.8	8.8	40.1	8.9	11,5	2,3	
136	13.9	9.1	39.9	8.9	8	2,3	
117	4.9	9.0	30.7	13	1,(8)	2,3	
127	4.9	9.0	28.1	12	4,5	2,3	
137	5.2	9.8	25.9	10	1	2,3	4
118	2.2	9.5	11.5	7.1	5	2	
128	2.0	8.2	15.6	11	5	2,3	
138	2.4	12	15.0	11	5	2,3	
119							9
129							9
139							9

TEST NO. 270A PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	38	8.8	69	11	3	1	
125	61	17	75	12	11,5	1	
135	53	14	81	14	12	1	
116	15	9.8	56	15	12	1	
126	17	12	59	16	12,11	2	
136	15	11	56	15	11	2	
117	5.4	11	31	13	5	2	
127	5.2	9.7	33	14	12	2	
137	1.2	0.5	4.1	1.0	1	1	2
118	2.4	11	18	13	12	2	
128	1.9	7.1	13	8.0	5	2	
138	2.2	8.8	17	12	8	2	
119	1.2	13	11	16	8	2	
129	1.1	12	10	13	12,11	2	
139	1.1	11	10	13	11	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 275 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	9.9	1.2	138	6.1	2	1	
127	9.5	1.1	103	3.8	2	1	
137	9.7	1.2	148	6.8	10,11	1	
118	4.1	1.3	89	6.3	1	2	
128	4.3	1.5	57	3.1	1	1	
138	4.1	1.4	76	4.8	1	1	
119	1.7	1.1	46	5.0	5,4	1	
129	1.6	1.0	42	4.4	1(12)	1	
139	1.6	1.0	48	5.3	1(4)	1	
110	1.0	1.5	33	6.8	12	1	
120	0.8	1.0	34	7.1	1(5)	1	
130	1.1	2.0	36	7.6	1(5)	1	
111	0.4	1.0	16	6.4	11,12,5	1	
121	0.4	1.5	13	4.7	1,5	1	
131	0.4	1.5	17	6.7	4,5	1(3)	

TEST NO. 278 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	-	-	-	-	7,2,4	2	5
127	42	10	-	-	10,2,4	2	
137	47	12	287	21	2,7	1	
118	16	14	170	18	5,4	1	
128	18	16	149	15	2	2	
138	18	16	174	19	2	2	
119	5.6	12	92	14	2,10	2	
129	5.9	13	94	15	2,10	2	
139	5.7	12	98	15	1	1	
110	2.3	11	52	14	10	1	
120	2.5	12	52	14	3	1	
130	1.7	5.6	39	8.6	1	1	
111	1.1	12	31	15	10,7	1	
121	0.5	-	13	-	1,3	1	
131	1	9.2	31	15	9	1	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 282 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	-	-	251	17	2	1	
127	-	-	186	10	2,7	1	5
137	43	11	193	11	7,2	1	
118	17	14	169	18	4	2	
128	15	12	156	16	4	2	
138	16	14	160	17	3	1	
119	6.4	15	86	13	1,2	2	
129	5.8	13	86	13	1	2	
139	4.8	9.0	88	13	10,8	1	
110	2.6	13	52	14	7	2	
120	2.2	9.4	48	12	8	1	
130	2.4	11	51	13	8	1	
111	1.1	12	34	17	7,2	-	
121	1.0	9.5	27	12	1,2	-	
131	1,1	11	29	14	7	-	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 047 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	15.2		25.2		7	2	
125	16.5	12	24.7	10	12(5)	2	
135	-		-		7(10)	2	
116	4.9		13.8		10(3)	2	
126	5.0	8.6	14.2	8.5	10(2)	2	
136	5.2		15.7		1	2	
117	2.7		9.3		1	2	
127	-	11	-	9.2	-	-	2
137	2.1		7.0		1	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 049 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	14.4		23.0		12(5)	1	
125	17.7	12	29.3	11	12(2)	1	
135	15.6		24.9		10(2)	2	
116	6.0		16.8		1(2)	1	
126	6.7	11	18.4	11	10	2	
136	5.6		15.6		1(2)	2	
117	2.6		11.1		1	2	
127	-	11		13	-	-	2
137	3.4		9.2		3(1)	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 085 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	17.3	14	16.2	11	1	2	
125	17.0	14	24.7	10	7	2	
135	13.8	9.9	21.9	8.4	7	2	
116	6.0	11	16.2	11	1	2	
126	5.9	11	14.7	9.2	1	2	
136	6.7	13	18.7	13	1	2	
117	2.5	12	9.4	12	1	2	
127	2.4	11	8.8	10	1	2	
137	2.8	15	8.9	11	1	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 046 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.3		35.2		1	2	
125	19.0	16	39.7	19	12	3	
135	17.0		32.3		12(2)	1	
116	7.8		22.3		1	1	
126	6.9	15	21.3	17	1	2	
136	7.0		22.2		1	2	
117	3.0		13.6		1(10)	(2)	
127	-	16	-	18	-	-	2
137	2.7		12.5		5	2	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 088 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	6.6	2.8	15.8	4.9	1	2	
125	6.6	2.9	14.3	4.2	1	1	
135	8.0	4.1	14.5	4.3	1	2	
116	2.8	2.7	8.9	4.3	1	2	
126	3.6	4.4	9.0	4.3	1	2	
136	3.7	4.6	9.6	4.9	1	2	
117	-	-	-	-	-	-	9
127	1.4	3.4	5.2	4.7	1	1	
137	1.5	3.8	5.0	4.5	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 100 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	27.0	25	43.8	26	1	2	
125	30.4	33	44.1	27	1(7)	2	
135	24.6	24	39.6	23	1(7)	2	
116	9.4	24	27.7	25	1	2	
126	10.2	27	31.6	30	1	2	
136	8.8	21	28.9	26	1	2	
117	3.2	20	15.0	23	1	2	
127	2.9	18	14.9	23	1	2	
137	3.7	26	17.4	28	1	2	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE

L/D:4, D_o/D_t:0.1375

TEST NO. 301 PROPELLANT WT. 94000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	39	2.5	218	3.6	2	2	
127	-	-	-	-	2,3	2	
137	-	-	-	-	2,3	2	
118	13	2.6	163	4.5	1(5,8)	2	
128	12	2.3	182	5.4	1(5,8)	2	
138	12	2.3	130	3.1	1(5,8)	2	
119	5.1	2.7	66	2.3	1	3	7
129	5.6	3.2	85	3.4	1	3	7
139	6.0	3.7	83	3.2	1	3	7
110	2.3	2.4	-	-	2,3	2	
120	2.1	2.1	-	-	3,5	1	
130	2.5	3.1	-	-	2	2	
111	1.1	2.6	33	4.2	1(3)	1	
121	1.3	3.9	35	4.6	3	1	
131	1.1	2.5	34	4.3	9(3)	1	

GROUP 4

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

L/D	PROPELLANT WEIGHT (lb)	VELOCITY RANGE	PROPELLANT ORIENTATION	TEST NO.	TERMINAL YIELD (%)	IGNITION TIME (msec)
1.8	200	Low 23 ft/sec	Normal	096	14	50
				144	24	190
				202	42	870
				248	25	210
			Reversed	097	32	240
		Medium 44 ft/sec	Normal	208	62	460
				232	30	1220
				249	50	710
				250	52	200
	1000	Medium 44 ft/sec	Normal	218	4	0
				219	14	1835
				220	96	525
				267	64	1770
				268	70	340
	25000	Medium 44 ft/sec	Normal	284	2	0
				285	37	465
	200	High 78 ft/sec	Normal	110	26	35
				141	5	0
				205	41	40
				206	85	350
				207	38	28
				236	74	720
	200	High 78 ft/sec	Reversed	107	29	42
				142	14	33
	1000	High 78 ft/sec	Normal	190	96	570
				269A	44	77
5	200	Low 23 ft/sec	Normal	098	14	300
				154	18	470
			Reversed	099	23	140
		High 78 ft/sec	Normal	109	10	40
			Reversed	108	31	60

LO_2 RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 096 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	16.0	12	29.9	14	1	1	
125	14.7	11	27.6	12	1	2	
135	15.9	12	27.8	12	1	2	
116	6.7	12	21.1	16	1	1	
126	6.3	12	23.2	18	1	1	
136	2.7	14	10.3	14	1	1	
117	2.7	14	10.8	14	1	1	
127	2.4	11	11.2	15	1	1	
137					1	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 144 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	38.9	22	4(5)	1	
125	-	-	37.9	21	4(5)	1	
135	20.1	18	39.6	23	4	2	
116	7.8	18	26.2	23	1	1	
126	8.7	21	27.8	24	1(3)	1	
136	8.4	20	27.4	24	1	1	
117	3.4	22	15.6	24	1	1	
127	3.8	27	15.3	23	4	1	
137	3.6	25	14.8	22	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 202 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	29.6	31	49.7	33	4	2	
125	34.6	39	55.7	41	4	2	
135	19.1	16	48.5	32	4	3	
116	8.7	21	34.4	35	4	3	
126	10.0	-	38.5	42	4	3	12
136	13.2	-	41.0	47	4	3	12
117	4.5	-	24.7	48	4	2	12
127	3.9	-	24.5	47	4	2	12
137	4.7	41	24.3	46	1	3	
118	-	-	-	-	-	-	9
128	2.0	39	13.9	48	4	2	
138	1.7	-	12.7	42	4	3	12
119							9
129							9
139							9

TEST NO. 248 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	23.5	22	38.3	21	4	1	11
125	18.2	16	31.7	16	1(12)	1	
135	16.8	13	31.2	15	5	1	
116	7.5	17	23.6	19	4(5)	1	
126	7.6	17	23.9	19	5(12)	1	
136	5.6	9.9	22.3	17	5(4)	1	
117	3.2	20	15.2	23	4(5)	1	
127	2.9	17	12.9	18	4(5)	1	
137	3.4	23	14.4	22	4	1	
118	1.7	27	8.8	24	5(4)	1	
128	1.3	15	7.2	18	4(5)	1	
138	1.3	16	8.3	22	5	1	
119	0.8	22	5.3	27	4(5)	1	
129	0.8	29	4.0	24	5(10)	1	
139	0.8	22	5.2	27	4(5)	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity, Reversed Propellant Orientation

TEST NO. 097 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	26.7	27	39.2	22	1	1	
125	21.0	19	46.5	29	1	2	
135	28.4	29	46.3	29	1	2	
116	11.0	31	33.0	32	1	1	
126	10.3	28	37.8	40	1	1	
136	11.5	33	34.3	35	1	1	
117	4.2	33	19.6	24	1	1	
127	4.2	33	20.8	36	1	1	
137	3.8	37	18.3	30	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 208 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	12.0	8.0	49.4	33	4(5)	2	
125	21.5	19	44.2	27	4(7)	2	
135	-	-	-	-	10,4,3	2	3
116	6.4	12	39.4	44	10,4	2	
126	9.3	23	40.0	45	12,4,5	1	
136	-	-	58.5	83	10,4	2	
117	3.3	-	24.7	48	4,5	1	
127	3.8	-	23.6	44	4,5	1	
137	4.6	-	28.4	58	4,5	1	
118	-	-	-	-	-	-	9
128	2.3	55	16.6	63	4,5	1	
138	2.5	63	17.8	69	6	1	
119							9
129							9
139							9

TEST NO. 232 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	20.1	18	40.1	23	4	1	
125	26.1	26	46.7	31	4(5)	1	
135	18.9	16	44.5	27	4	1	
116	5.7	10	25.5	21	4(5)	2,3	
126	5.9	11	27.7	26	4(5)	2,3	
136	5.8	11	33.3	33	4	2	
117	-		-	-	-	-	9
127	3.1	19	16.1	25	1	2	
137	-	-	-	-	-	-	9
118	1.5	22	9.5	27	4	2,3	
128	1.6	24	10.2	31	1(4)	1	
138	-	-	-	-	-	2	9
119	-	-	-	-	3	2	
129	0.8	27	6.1	33	1	2	
139	-	-	-	-	3	2	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 249 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	24.0	22	57.4	13	4	1	
125	23.6	23	48.7	32	4	1	
135	17.9	15	42.7	25	4(5)	1	
116	6.7	13	30.5	28	4	1	
126	10.6	29	36.9	38	4(5)	1	
136	8.2	19	36.7	39	5(4)	1	
117	3.6	25	22.9	42	4	1	
127	4.0	30	20.3	35	4(5)	1	
137	4.1	35	22.2	11	4	1	
118	1.8	31	13.3	44	4(5)	1	
128	1.8	30	11.2	34	4(5)	1	
138	1.9	34	12.6	42	5(1)	1	
119	-	-	8.6	54	5(1)	1	
129	1.0	54	7.4	44	(5)	1	
139	1.0	51	7.6	45	1(5)	1	

TEST NO. 250 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	33.5	37	73.3	65	1(5)	1	
125	29.4	32	47.4	51	1	1	
135	31.4	34	48.0	31	1	1	
116	8.4	21	32.0	31	1(5)	1	
126	6.6	13	29.5	27	1	1	
136	10.8	30	42.1	48	4(5)	1	
117	4.6	40	22.7	42	1	1	
127	3.8	28	21.8	40	4	1	
137	5.2	49	25.6	50	4	1	
118	2.3	53	13.4	45	1(4)	1	
128	1.6	24	9.9	29	1(4)	1	
138	1.9	35	13.9	18	4(8)	1	
119	1.1	55	9.3	60	5(4)	1	
129	1.2	62	8.02	48	1(4)	1	
139	1.0	51	8.0	48	1(4)	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 218 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.6	3.4	-	-	3	2,3	
125	15.4	2.4	49.2	6.6	1	3	
135	23.6	4.5	36.4	3.9	11,3	1	
116	8.3	3.9	-	-	5,11	2,3	
126	7.9	3.7	33.1	6.4	5	1	
136	-	-	-	-	3	1	
117	2.4	2.3	14.0	4.1	1(5)	2	3
127	2.4	2.1	15.7	4.8	1(5)	2	3
137	3.1	3.7	17.3	5.6	1(5)	2	3
118	1.2	2.6	9.6	5.4	1(5)	2	3
128	1.1	2.3	8.1	4.2	1(5)	2	
138	1.0	2.1	8.2	4.3	8	2	
119	0.7	3.3	6.2	6.7	4(5)	1	3
129	0.6	2.9	5.9	6.4	10,5	2	3
139	0.6	2.2	5.0	5.3	5	1	3

TEST NO. 219 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	28.3	5.7	68.2	11	4	2,3	
125	-	-	49.1	6.6	8,4	2	
135	33.9	7.5	52.1	7.3	4	2,3	3
116	8.2	3.8	52.2	14	5	2,3	
126	9.1	4.5	48.0	12	4	1	
136	12.7	7.6	48.2	12	5(4)	1	
117	3.6	5.1	37.0	18	5(4)	2	
127	4.1	6.3	31.1	14	5(4)	1	3
137	5.1	9.4	32.9	15	4	1	
118	1.8	5.9	21.3	18	4	1	
128	2.2	9.9	19.4	15	4	3	
138	2.1	9.1	17.1	13	1(4)	1	
119	1.2	12	13.0	19	5,4,8	1	
129	1.0	10	11.7	17	5,4,8	1	
139	1.0	11	10.3	14	5(4)	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 220 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	182	65	543	484	6,4,7	2,3	
125	-	-	244	102	4,7	2,3	
135	-	-	-	-	6	2,3	
116	-	-	-	-	6	2,3	
126	-	-	-	-	6	2,3	
136	-	-	-	-	6	2	
117	16.2	65	96.2	84	4,5	2,3	
127	14.2	59	99.8	89	4,5	2,3	
137	22.3	104	107	99	4	3	
118	5.5	58	68.7	104	4,5	1	
128	5.7	62	65.9	98	4(5)	3	
138	5.3	54	60.2	86	4(5)	1	
119	3.3	114	46.5	127	5(4)	2,3	3
129	2.6	70	40.3	104	5,(4)	3	
139	2.4	58	40.5	104	5(4)	2,3	

TEST NO. 267 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	50.4	13	188.7	63	4(7)	2,3	
125	50.3	13	212.3	79	4(5)	1	
135	264.8	114	215.4	81	4,7,3	2	
116	35.8	36	122	59	4,11,12	2	
126	26.8	24	116	55	4,8,11	2	
136	108	150	138	71	4,7	2	
117	13.2	47	87	71	4	1	
127	11.3	36	91	77	4	2	
137	5.3	10	-	-	4	1	
118	5.0	48	55.7	75	4	1	
128	6.0	70	67.4	99	4(12)	1	
138	4.7	43	46.2	56	4	1	
119	2.5	62	35.4	85	4	1	
129	2.3	55	31.5	71	4(5)	1	
139	2.1	45	28.7	63	4(5)	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 268 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	155	53	296	144	10,12,3	3	
125	112	36	200	70	10,12,3	1	
135	143	48	230	91	12,4	1	
116	37.2	37	140	73	12,4	1	
126	48.7	52	125	61	12,9,4	3	
136	41.8	44	118	56	12,4	1	
117	11.4	37	86.4	71	4,12,8	1	
127	12.0	41	79.9	61	4	1	
137	-	-	-	-	4,11	1	2
118	6.0	68	49.4	62	12	1	
128	5.8	65	47.0	58	12,11	1	
138	4.4	39	47.7	59	12,11,84	1	
119	2.6	70	37.2	93	3	1	
129	2.6	68	27.6	59	11,	2	
139	2.4	59	30.7	70	3	2	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 284 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	9.2	1.1	-	-	7,2	1	5
127	11	1.5	62	1.6	1	1	15,2
137	12	1.7	62	1.6	1	1	
118	3.7	1.1	34	1.4	1	1	
128	3.4	1.0	35	1.5	1	1	
138	4.2	1.5	37	1.6	1	1	
119	1.8	1.2	22	1.7	1	1	
129	1.7	1.2	21	1.6	1	1	
139	1.9	1.4	23	1.8	5	1	
110	0.8	1.0	11	1.5	8	1	
120	0.8	0.9	13	1.8	1	1	
130	0.9	1.3	13	1.7	8	1	
111	0.4	1.0	7.2	1.9	8	1	
121	0.4	1.2	7.4	2.0	1	1	
131	0.4	1.5	7.1	1.9	3,5,7	1	

TEST NO. 285 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	99	33	-	-	7,2	2	
127	-	-	410	42	8,2	1	
137	73	23	391	38	7,4,3	2	
118	19	19	249	37	4,2	2	
128	19	19	209	27	4,2	3	
138	25	27	230	32	5,2	1	
119	10	37	146	32	4	2	
129	9	30	157	35	1	1	
139	-	-	-	-	9	3	
110	4.1	35	96	36	4	1	
120	3.5	25	85	30	8	1	
130	4.1	36	98	36	4,2	1	
111	1.8	38	55	38	7	1	
121	1.6	29	59	42	7,5	1	14
131	1.8	36	55	38	5	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 110 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	16.8	13	33.4	17	5	1	
125	19.7	17	51.7	36	1	1	
135	18.7	16	52.0	36	1	2	
116	8.6	21	30.6	29	1	1	
126	8.2	19	34.4	34	1	1	
136	8.0	19	30.5	29	1	1	
117	3.2	21	18.3	30	1	1	
127	3.2	19	20.9	38	1	1	
137	3.2	19	17.7	29	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 141 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	7.5	3.6	17.0	5.5	4(5)	1	
125	8.5	4.6	20.8	7.8	4	1	
135	7.5	3.7	18.3	6.3	4	2	
116	3.3	3.7	10.3	5.4	4(5)	2	
126	3.5	4.2	-	-	5	2	
136	-	-	11.4	6.2	10(4)	2	
117	1.5	3.9	5.8	5.5	4(5)	1	
127	1.7	4.8	5.2	5.1	5	1	
137	-	-	-	-	-	-	9
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 205 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	32.5	35	63.0	50	1	1	
125	34.4	39	68.6	58	1(12)	2	
135	31.8	34	55.5	41	1(12)	2	
116	12.4	38	41.9	48	1(5)	2	
126	11.9	35	39.4	43	1(5)	3	
136	12,0	36	44.1	53	1	3	
117	4.7	40	25.7	50	1	1	
127	4.8	41	24.9	49	4(5)	3	
137	4.8	42	24.5	49	1	1	
118	-	-	-	-	-	-	9
128	2.1	43	14.1	48	4(5)	1	
138	1.8	30	12.8	42	6(5)	1	
119							9
129							9
139							9

TEST NO. 206 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	6,4,7	2	
125	-	-	-	-	6,4,7	2	
135	-	-	-	-	6,4,7	2	
116	-	-	65.6	102	6,4	2	
126	-	-	65.5	100	4(6)	2	
136	17.8	66	71.0	115	4	2	
117	5.5	-	39.6	98	4	1	
127	5.5	-	40.0	100	4	2	
137	6.3	68	37.7	91	1(4)	1	
118	-	-	-	-	-	-	9
128	2.9	85	24.4	108	6	1	
138	2.3	84	22.0	94	6	1	9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 207 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	27.9	28	52.3	36	1	1	
125	29.3	31	50.2	34	1(4)	2	
135	29.1	30	52.4	37	12(4)	2	
116	10.5	29	36.2	38	1(5)	1	
126	10.0	26	34.4	34	12(5)	1	
136	10.3	28	39.3	43	1	1	
117	3.7	28	20.4	35	8	1	
127	3.9	30	20.8	37	4(5)	1	
137	4.0	31	20.8	37	5	1	
118	-	-	-	-	-	-	9
128	1.7	29	12.2	39	5(4)	1	
138	1.9	37	14.3	49	5(4)	1	
119							9
129							9
139							9

TEST NO. 236 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	17.2	14	58.7	44	4,7	1	12
125	24.1	23	64.3	52	4	1	
135	18.5	16	59.9	46	4,5	3	
116	10.5	29	44.1	53	4(5)	3	
126	12.2	36	51.1	67	4	3	
136	10.1	27	39.6	44	4(5)	1	
117	6.3	70	27.8	57	4	3	
127	4.2	35	28.4	59	5(4)	3	
137	3.9	30	28.6	60	4,5	1	
118	2.6	72	17.3	66	5(4)	2	
128	2.4	57	17.4	67	5(4)	1	
138	2.1	45	-	-	4(5)	2	
119	1.4	92	12.8	95	9	1	
129	1.3	73	10.7	73	4(5)	1	
139	1.0	51	9.5	62	5(4)	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity, Reversed Propellant Orientation

TEST NO. 107 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	18.0	15	42.2	25	1(5)	1	
125	23.0	22	44.8	28	1	1	
135	22.4	21	42.9	26	1	2	
116	9.2	23	31.2	30	1	1	
126	9.5	24	33.3	33	1	1	
136	10.1	27	31.0	29	1	1	
117	3.8	29	18.1	30	1	2	
127	4.1	31	18.1	30	1	1	
137	3.7	26	16.2	26	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 142 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	16.8	13	28.1	13	1(5)	1	
125	12.8	9	29.4	14	1	1	
135	15.3	12	28.4	13	1	1	
116	6.5	13	13.3	15	1(4)	1	
126	6.0	11	19.6	14	1(4)	1	
136	6.3	12	18.9	13	1(5)	1	
117	2.7	15	10.9	14	1	1	
127	2.6	13	10.4	13	1	1	
137	2.7	14	9.8	12	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 190 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	4	1	
125	154	53	422.8	305	3(7)	1	
135	103.4	32	-	-	3(4)	1	3
116	60.6	73	153	84	6,11	2	
126	48.4	52	124.2	60	10,11,6	1	
136	39.6	41	124.2	61	4	3	
117	19.0	82	80.7	62	6,7,3	2	
127	14.8	57	119.7	120	6,4	2	
137	18.2	77	111	105	4	2	
118	6.7	81	68.6	101	4	2	
128	6.3	74	74.9	119	4	2	
138	6.2	72	78.3	128	4	2,3	
119							9
129							9
139							9

TEST NO. 269A PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	71.4	20	136	36	3	1	
125	82.8	25	160	48	12	1	
135	55.7	15	186	62	3,12	1	
116	25.9	23	97.5	40	5,3	1	
126	32.5	31	87.6	33	4,12	3	
136	25.7	22	103	44	1(5)	1	
117	11.1	36	63.3	41	12,5(4)	1	
127	10.2	32	65.4	44	4	1	
137	-	-	-	-	11(3)	1	2
118	4.7	45	40.3	44	1	1	
128	4.5	40	38.1	41	1(3)	1	
138	4.7	44	40.4	44	1(3)	1	
119	2.1	44	25.1	49	5,3,11	1	
129	2.1	45	23.9	46	11	1	
139	2.0	41	22.4	42	11,3	1	

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D: 5, Low Velocity, Reversed Propellant Orientation

TEST NO. 098 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	14.2	10	28.6	13	1	1	
125	13.6	10	32.4	16	1	2	
135	17.1	14	29.3	14	1	2	
116	6.7	13	19.3	14	1	1	
126	6.1	11	21.6	16	1	1	
136	6.5	13	20.0	14	1	1	
117	2.8	15	11.6	16	1	1	
127	2.6	13	11.7	16	1	1	
137	2.6	14	10.3	14	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 154 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	13.0	9.0	31.2	15	1(5)	1	
125	15.1	12	33.5	17	1(5)	1	
135	15.9	12	-	-	3,12	2	
116	9.0	13	22.9	18	1(4)	1	
126	11.0	13	22.5	17	1(5)	1	
136	10.3	12	24.7	20	1(4)	1	
117	5.7	19	13.2	19	1	1	
127	2.8	15	12.9	18	4(5)	1	10
137	-	-	14.2	21	4	1	4,3
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D: 5, Low Velocity, Reversed Propellant Orientation

TEST NO. 099 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.3	19	39.4	22	1(5)	1	
125	19.5	17	40.5	24	1	2	
135	17.1	14	39.4	22	1(5)	2	
116	8.4	20	26.8	23	1	1	
126	8.4	19	29.2	26	1	2	
136	8.7	21	29.7	27	1	2	
117	3.6	25	15.8	24	1	1	
127	3.2	19	16.2	25	1	1	
137	-	-	-	-	10,3	2	10
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, High Velocity, Reversed Propellant Orientation

TEST NO. 109 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.2	6.2	22.3	8.7	5	1	
125	13.4	9.7	25.4	11	1	1	
135	12.4	8.6	24.0	9.9	1	2	
116	5.7	10	16.2	11	1	1	
126	5.4	8.9	17.2	12	1	1	
136	5.7	10	17.4	12	1	1	
117	2.2	9.7	8.6	10	1	1	
127	2.3	10	9.0	11	1	1	
137	2.4	10	8.4	9.5	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5.1, High Velocity, Reversed Propellant Orientation

TEST NO. 108 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	-	-	9
125	20.2	18	49.4	33	1	2	
135	20.2	18	43.3	16	1	2	
116	11.8	35	32.6	32	1	1	
126	10.7	30	35.0	35	1	1	
136	9.5	25	34.2	34	1	1	
117	4.0	30	17.2	28	1	1	
127	4.2	35	19.3	33	1	1	
137	4.0	31	17.8	28	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

GROUP 5

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE – HORIZONTAL
(All tests 200-lb Propellant Weight)

PROPELLANT TYPE	VELOCITY RANGE*	PROPELLANT ORIENTATION	TEST NO.	TERMINAL YIELD (%)	1ST PROP. TO 2ND PROP.	2ND PROP. TO IGNITION
LO_2/RP-1	Low 23 ft/sec	Normal	121	30	**	184
			122	28	388	139
			123	25	362	53
			176	65	468	374
			177	30	111	203
		Reversed	155	55	314	202
			156	63	182	230
	High 78 ft/sec	Normal	124	5	238	0
			125	52	142	76
			127	42	510	55
			140	12	420	10
			179	12	787	23

* Velocity shown for top propellant only. Bottom propellant velocity ~12 ft/sec for all tests.

** RP-1 on ground at start of film.

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 121 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	47.0	30	4(5)	1	
125	18.9	16	37.2	21	1(4)	1	
135	18.0	15	43.5	27	1(4)	1	
116	7.4	16	29.2	27	4	1	
126	7.5	16	28.6	26	1(4)	1	
136	6.8	14	33.7	33	1(4)	1	
117	4.1	32	17.2	28	1(4)	1	
127	-	-	17.1	28	4	1	
137	3.9	30	18.8	32	1(4)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 122 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	44.4	27	4(5)	1	
125	16.9	14	40.9	24	1(5)	1	
135	18.0	15	-	-	3	2	3
116	-	-	-	-	3	1	10
126	9.1	22	31.2	28	1(5)	1	
136	9.0	22	28.9	26	1(5)	1	
117	3.8	28	16.5	27	1	1	
127	4.0	30	17.9	30	1(5)	1	
137	3.7	26	17.1	28	1(10)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 123 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	48.1	32	4	1	
125	21.3	19	51.4	36	4(5)	1	
135	27.3	27	-	-	4	2	3
116	-	-	-	-	4	1	10
126	7.9	18	35.9	37	4(10)	1	
136	9.6	25	35.8	37	4(5)	1	
117	3.9	29	18.8	32	1		
127	3.9	29	21.3	38	4(5)	1	
137	4.0	30	20.5	36	4	1(10)	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 176 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	6(4)	2	
125	-	-	-	-	6(4)	2	
135	-	-	-	-	6(4)	2	3
116	13.1	41	57.9	83	6(4)	2	
126	-	-	-	-	6(4)	2	3
136	12.7	39	59.2	85	12(4)	2	
117	-	-	33.8	76	4(5)	1	
127	5.5	54	-	-	4(5)	1	
137	5.6	56	32.9	73	4(5)	2	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 177 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	25.4	24	49.1	33	4(5)	1	3
125	23.1	22	50.4	34	4(5)	2	
135	-	-	-	-	10,(4)	2	3
116	-	-	31.7	30	10(4)	1	
126	8.8	21	-	-	4(12)	1	
136	-	-	-	-	4(5)	1	3
117	3.5	24	19.4	33	4(5)	1	
127	3.5	24	20.5	36	4(5)	1	
137	3.7	26	20.3	35	4(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity, Reversed Propellant Orientation

TEST NO. 155 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	63.2	51	4	1	
125	37.5	43	60.4	47	4	2	
135	31.5	34	-	-	4	2	
116	11.3	33	44.4	54	4	1	
126	10.2	27	42.8	50	4	1	
136	12.0	36	46.0	56	4	1	
117	5.5	56	27.3	56	4(10)	1	
127	6.0	63	25.5	50	4(5)	1	
137	5.5	54	26.9	54	4(10)	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 156 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	28.7	29	69.5	58	4	1	
125	42.2	51	76.4	70	4	2	
135	30.0	32	64.3	52	4(7)	2	
116	15.5	53	44.9	54	6	1	
126	11.3	32	48.7	60	4	1	
136	31.1	41	46.2	57	4	1	
117	6.4	71	29.5	62	4(10)	1	
127	5.2	50	30.0	63	4(10)	1	
137	6.1	66	30.9	66	4(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 124 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	6.8	3.2	17.4	5.8	1(4)	2	
125	6.4	2.8	19.1	7.2	1	1	
135	6.5	2.9	-	-	1(8)	2	3
116	-	-	-	-	1(4)	2	10
126	3.0	3.0	12.9	7.3	1	2	
136	-	-	13.0	7.9	4(5)	2	
117	1.3	2.7	6.1	5.9	1(11)	2	
127	1.3	2.9	6.2	5.9	1(10)	1	
137	1.3	2.9	7.4	8.0	1	2	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 125 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	65.7	53	1(4)	1	
125	34.0	38	62.8	51	1(4)	2	
135	37.0	42	65.9	54	1(4)	2	
116	-	-	-	-	1.7	1	10
126	12.6	37	45.6	55	1(5)	1	
136	13.8	44	50.5	66	4(5)	1	
117	5.3	52	23.8	46	1	1	
127	-	-	-	-	5(11)	1	
137	5.3	52	28.2	59	4(10)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 127 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	26.1	26	60.2	44	5	2	
125	24.9	24	57.8	44	4(5)	1	
135	-	-	-	-	1,12	1	3
116	-	-	-	-	1	1	10
126	11.4	33	42.5	49	1(4)	1	
136	12.2	37	40.1	45	4(5)	1	
117	4.4	36	21.6	39	1(4)	1	
127	4.5	38	25.6	50	1	1	
137	4.7	42	24.3	47	1(4)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 140 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	14.6	11	30.2	14	4(5)	2	
125	13.8	10	31.4	15	1	2	
135	12.7	8.8	-	-	4(5)	2	3
116	6.0	11	20.0	15	1(4)	2	
126	6.0	11	19.7	14	1(4)	2	
136	6.0	11	21.5	16	1	1	
117	2.4	11	10.8	14	1(4)	1	
127	2.7	14	11.2	15	1(5)	1	
137	2.6	13	10.7	14	1(4)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/RP-1 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 179 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	13.2	9.2	26.9	12	4(5)	1	
125	12.7	9.0	27.7	12	1(4)	1	3
135	-	-	-	-	3	2,3	3
116	-	-	-	-	10(11)	1	
126	5.0	7.9	17.3	12	11(5)	1	
136	5.3	8.9	17.9	12	11(5)	1	
117	2.6	13	10.3	13	4(5)	1	
127	2.4	11	10.3	13	4(5)	1	
137	2.5	12	10.3	13	4(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

GROUP 6

LO_2/RP-1 HIGH-VELOCITY-IMPACT TESTS

TARGET TYPE	PROPELLANT WEIGHT (lb)	IMPACT VELOCITY ft/sec	TEST NO.	TERMINAL YIELD (%)
Flat Wall	200	526	075	21
	200	523	077	20
Deep Hole	200	523	076	57
	200	518	078	77

LO_2/RP-1 HIGH-VELOCITY-IMPACT

L/D:1.8, Flat Wall

TEST NO. 75 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	11.9	28	39.4	47	12	1	
166	6.4	11	29.1	29	12	1	
176							9
147	3.9	26	16.9	27	12	1	
167	3.0	16	13.9	20	12	1	
177	2.4	10	9.1	10	12	1	
148	1.6	25	9.1	22	12	1	
168	1.3	15	7.8	18	12	1	
178	1.2	12	5.3	9	12	1	
149	0.8	29	6.1	28	8(12)	1	
169	0.6	14	4.5	16	3	1	
179	0.5	13	3.6	11	3	1	

TEST NO. 77 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	7.7/5.5	16	33.8	37	12,4	1	12
166	4.1/3.9	6.0	21.0	17	12,4	1	12
176							9
147	2.9/2.5	16	16.4	26	12,4	1	12
167	1.9/2.0	6.0	13.1	17	12,4	1	12
177	1.7/0.7	4.0	10.5	12	10,12,4	1	12
148	1.2/1.1	13	9.0	22	4(12)	1	12
168	0.9/0.9	7.0	7.5	17	4	1	12
178	1.0/0.5	8.0	6.4	13	12,4	1	12
149	0.6/0.8	27	5.8	26	4	1	12
169	0.5/0.6	11	4.5	16	4	1	12
179	0.5/0.3	8.0	4.0	13	8,4	1	12

LO_2/RP-1 HIGH-VELOCITY-IMPACT

L/D:1.8, Deep Hole

TEST NO. 76 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	37.2	119	78.4	131	12	1	
166	8.2	17	39.5	46	12(4)	1	
176							9
147	7.0	71	37.4	94	12	1	
167	4.5	32	23.7	45	12	1	
177	2.0	7.0	17.6	29	4	1	
148	2.6	66	20.8	82	12	1	
168	2.0	36	13.7	43	12	1	
178	0.9	7.0	11.1	30	4	1	
149	1.3	85	13.2	93	8	1	
169	0.9	34	8.9	46	3	1	
179	0.6	11	6.3	27	4	1	

TEST NO. 78 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
145							9
165							9
175							9
146	25.1	76	82.2	143	12	1	
166	7.5	15	39.8	46	12(4)	1	
176							9
147	7.5	79	42.5	117	12,3	1	
167	4.1	28	24.9	47	12(4)	1	
177	2.0	7.0	15.5	23	12,4	1	
148	2.8	76	21.2	87	3	1	
168	1.8	32	16.0	54	4	1	
178	1.2	13	11.8	32	12,4	1	
149	1.6	120	14.5	106	8	1	
169	1.1	52	9.2	49	3	1	
179	0.7	19	7.5	34	4,8		

GROUP 7

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

L/D	D_o/D_t	PROPELLANT WEIGHT (lb)	TEST NO.	TERMINAL YIELD (%)	IGNITION TIME (msec)
1.8	1	200	050	86	180
			051	22	80
			093	34	147
	0.45	200	053	4	1
			090	29	35 sec
			091	13	0
			118	20	82
			199	8	816
			200	17	417
		Partial Full*	167	24	8.74 sec
			172	35	770
		1000	210	7	20
			212	27	1366
			213	35	708
			265	10	750
		25000	277	0.2	31
			279	0.2	33
			281	0.1	-
5.1	1	200	052	7	83
			057	1	12
			092	26	3 min
	0.45	200	054	6	17
			055	1	1
			094	25	329
			138	17	100

* Tank contained ~133 lb propellant.

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:1

TEST NO. 050 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	32		105		10(5)	1	
125	-	33	-	100	2(4)	1	
135	30		82		7	2	
116	-		-		2	2	
126	16.2	58	72	118	10(2)	1	
136	17.5		72		6(10)(7)	2	
117	7.0		47.8		5(2)	2	
127	-	72		100	5	1	2
137	6.0		39.8		3,11	2	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 051 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	11.3		40.6		1(5)	1	
125	14.4	8.4	41.0	24	5(2)		
135	12.0		39.3		11(5)	1	
116	7.8		31.3		1(5)	1	
126	6.4	15	25.1	21	10	1	
136	7.1		25.5		5	1	
117	-		-		-	-	9
127	-	-	-	-	11,5	1	2
137	3.1	18	16.6	25	8(2)	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:1

TEST NO. 093 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	22.0	20	66.5	54	1(12)	1	
125	21.9	20	53.4	37	1	2	
135	-	-	-	-	4,3,7	-	
116	9.5	24	42.4	49	1(12)	1	
126	10.2	27	38.5	42	1	2	
136	7.4	16	42.4	48	5	2	
117	3.6	25	22.4	41	5	2	
127	-	-	-	-	5,8,10,3	2	
137	3.4	22	24.3	48	1	2	
118							
128							
138							
19							
29							
139							

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 053 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	2.8		13.0		11(3)	2	
125	4.8	1.2	-	3.8	4(10)	1	
135	4.6		15.5		9(3)	2	
116	2.4		10.7		3(2)	1	
126	2.6	1.9	-	5.6	3(9)(4)	2	
136	2.3		10.9		4(2)	1	
117	1.2		6.2		11(3)	1	
127	-	2.1	-	6.1	11	2	2
137	1.1		6.1		4(3)	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 090 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	20.2	17	54.0	38	5	1	
125	18.6	16	45.5	29	1	2	
135	-	-	-	-	-	-	9
116	7.7	17	24.8	21	3	2	
126	7.9	18	24.3	20	1	2	
136	7.7	17	26.2	22	1	2	
117	-	-	-	-			
127	2.8	15	20.0	34	1	2	
137	3.7	26	22.5	41	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 091 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.1	6.1	37.8	21	5	1	
125	9.4	5.4	28.9	14	3	2	
135	9.7	5.7	34.6	18	3	2	
116	4.7	8.9	23.5	19	4	1	
126	4.5	7.9	23.2	18	5	2	
136	4.3	6.0	25.2	22	5	1	
117	1.6	4.6	12.7	18	8(5)	1	
127	2.1	8.0	13.8	20	4	1	
137	-	-	-	-	-	-	9
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 118 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.6	6.7	47.9	31	1(5)	1	8
125	10.6	6.8	41.2	24	4	1	8
135	11.2	7.2	46.6	30	1	3	8,6
116	5.5	9.5	31.2	29	1	1	8
126	5.1	8.2	34.0	34	4	1	8
136	5.4	9.3	35.7	37	1	1	8
117	2.2	9.2	18.2	30	1(4)	1	8
127	2.2	8.9	18.8	32	1(10)	1	8
137	2.1	8.9	17.9	29	1	1	8
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 199 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	8.0	4.2	26.6	12	1	2	
125	7.4	3.7	21.3	8.0	11,8	2	
135	7.2	3.4	28.9	13	1	2	
116	3.5	4.1	10.5	5.5	4(5)	2	
126	3.3	3.6	16.4	11	11,8	2	
136	3.5	4.1	19.6	14	5	2	
117	0.9	1.3	-	-	3,4,5	2	
127	1.6	4.4	8.2	9.3	5	2	
137	1.5	4.0	7.8	8.6	1(11)	2	
118	-	-	-	-	-	-	9
128	0.8	5.5	5.6	12	4(5)	1	
138	0.7	3.2	5.3	12	5	1	
119							9
129							9
139							9

TEST NO. 200 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.3	6.2	33.7	18	10,4,5	2	
125	8.8	4.9	31.9	16	1(5)	2,3	
135	9.9	5.7	41.5	24	1(12)	1	
116	3.8	4.9	19.6	14	1	2,3	
126	4.4	7.4	22.2	17	11,4,5	2,3	
136	5.1	8.2	20.9	16	1	1	
117	-	-	-	-	10	2	2
127	1.7	4.7	11.6	15	5,4	2	
137	1.4	3.2	9.7	12	5,(4)	1	
118	-	-	-	-	-	-	9
128	0.7/0.8	-	10.7	32	10,4	3	
138	0.9	5.8	8.5	22	5	1	
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

Partial Full

TEST NO. 167 PROPELLANT WT. 200* LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	10,4	2	
125	15.6	12	51.9	36	4(5)	2	
135	15.5	12	-	-	3	2	3
116	-	-	-	-	3	2	
126	-	-	-	-	3	2	
136	7.8	18	34.5	35	4	2	
117	3.3	21	17.6	29	4(5)	2	
127	3.5	24	19.5	33	4(5)	2	
137	3.3	21	18.6	31	4	2	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 172 PROPELLANT WT. 200* LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	22.4	20	53.7	38	4	1	
125	23.6	22	-	-	4	2	
135	-	-	-	-	3	2	3
116	10.2	28	39.8	45	4	2	
126	-	-	-	-	4(7)	2	
136	-	-	-	-	4(7)	2	
117	3.9	30	22.7	42	4(5)	2	
127	-	-	21.6	39	5	2	
137	3.9	30	22.3	41	5	2	4
118							9
128							9
138							9
119							9
129							9
139							9

* Calculations based on this value. Actual propellant weight 133 lb.

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 210 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	13.6	1.9	66.2	11	4	2	
125	7.4	0.7	59.4	9.1	1(8)	2	
135	9.5	1.1	72.8	13	3(4)	1	
116	5.3	1.7	44.7	11	4	2	
126	3.9	1.02	52.1	14	4	2	
136	4.3	1.2	46.7	11	4	2	
117	2.1	1.6	24.6	9.4	4	2,3	
127	1.8	1.1	30.6	13	4	2,3	
137	2.1	1.6	34.5	16	4	2	
118	1.1	2.1	15.9	11	4	2,3	
128	1.0	2.0	15.5	11	4	2,3	
138	0.9	1.9	15.6	11	4	2,3	
119							9
129							9
139							9

TEST NO. 212 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	15.6	2.6	-	-	3	2,3	
125	12.1	1.7	109.0	25	4(8)	3	
135	14.2	2.1	109.0	25	4	3	
116	5.6	1.9	88.9	34	4	2,3	
126	4.8	1.5	67.8	21	4	3	
136	5.3	1.7	72.7	24	4	3	
117	2.9	3.4	50.2	29	4	2,3	
127	2.4	2.3	42.2	22	4	3	
137	3.0	3.6	36.8	18	4	3	
118	-	-	-	-	4,5,3	2,3	
128	3.6	26	36.1	39	5	2,3	
138	3.0	19	33.2	34	5	2,3	
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 213 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	54.0	14	127.0	33	4(7)	2,3	
125	64.9	18	104.0	24	1(5,4)	2	
135	82.8	24	90.1	18	1(12)	3	
116	19.7	16	78.7	28	4,5,12	2,3	
126	23.4	19	80.6	29	12,5	2,3	
136	25.0	21	68.5	22	1(5)	2,3	
117	7.5	19	59.7	38	4(5)	2,3	
127	7.4	18	59.8	38	4(5)	2,3	
137	9.3	27	53.2	31	4	2,3	
118	3.1	20	31.7	32	5	2,3	
128	3.6	27	34.8	37	5(11)	2,3	
138	3.0	18	40.3	46	5	2,3	
119	-	-	-	-	3	2,3	
129	1.7	28	23.5	47	4,5	2,3	
139	1.5	21	22.2	43	4	2,3	

TEST NO. 265 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	11.5	1.5	40.3	4.6	4(5)	2	
125	12.0	1.6	38.5	4.3	8(12)	1	
135	17.8	3.0	97.4	21	12	1	
116	6.9	2.8	53.0	14	4(5)	2	
126	5.6	1.9	36.8	7.7	4	1	
136	5.4	1.9	84.8	32	12(5)	1	
117	2.9	3.4	36.9	18	12,4	2	
127	2.2	1.8	33.9	15	12,4	1	
137	0.7	-	-	-	12,8	1	2
118	1.4	3.9	18.7	15	4	2	
128	1.6	4.7	21.8	18	4	1	1
138	1.3	3.2	20.7	17	8(4)	1	
119	0.7	3.6	10.9	15	4	1	
129	0.7	3.9	11.1	16	4	1	
139	0.7	4.1	11.2	16	4	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 277 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	2.9	0.1	16	0.2	1	1	2,15
127	3.7	0.2	20	0.3	7	1	2,15
137	2.2	0.1	27	0.4	1	1	2,15
118	1.1	0.1	10	0.2	1	1	2,15
128	1.0	0.1	9	0.2	1	1	2,15
138	0.7	0.03	7.8	0.2	11	1	2,15
119	0.6	0.1	5.9	0.3	1	1	2,15
129	0.6	0.1	5.4	0.2	1	1	2,15
139	0.4	0.03	5.5	0.2	1	1	2,15
110	0.3	0.1	4.0	0.3	8,4	1	2,15
120	0.04	0.2	2.1	0.1	1	1	2,15
130	0.03	0.1	3.1	0.2	3	1	2,15
111	0.1	0.1	1.7	0.2	9	1	2,15
121	0.2	0.3	1.7	0.2	1	1	2,15
131	0.1	0.1	1.9	0.2	11	1	2,15

TEST NO. 279 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117							
127							
137							
118							
128							
138							
119					1	2	2,15
129					1	2	2,15
139					1	2	2,15
110	0.2	0.06	2.8	0.2	5	2	2,15
120	0.2	0.04	2.8	0.2	8	2	2,15
130	0.2	0.05	2.7	0.2	1	2	2,15
111	0.1	0.1	2.6	0.4	9	2	2,15
121	0.1	0.04	1.6	0.2	1	2	2,15
131	0.1	0.08	1.3	0.1	9	2	2,15

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, D_o/D_t:0.45

TEST NO. 281 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117						1	
127						1	
137					1	1	15,2
118					4	1	15,2
128					1	1	15,2
138					4	1	15,2
119					9	1	
129					8	1	
139					9	1	
110						1	
120						1	
130						1	
111	0.1	0.1	1.4	0.2	9	1	
121	0.1	0.1	1.3	0.1	1	1	
131	0.1	0.1	1.8	0.2	9	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:1

TEST NO. 052 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	6.0		15.4		9	2	
125	7.6	3.1	18.6	5.2	2(12)	1	
135	7.0		17.4		11(3)	2	
116	4.3		12.4		1(2)	2	
126	4.0	5.8	11.7	6.3	1(2)	1	
136	4.4		11.1		10(5)	2	
117	1.8		7.8		1	2	
127	-	5.2	-	7.8	5	2	2
137	1.7		6.8		5(1)	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 057 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	2.1		6.6		11(1)	1	
125	2.5	0.4	5.2	1.0	11	1	
135	2.8		5.1		9(1)	1	
116	1.8		4.4		1(2)	1	
126	1.4	0.8	4.2	1.5	3(1)	2	
136	1.8		4.5		1	1	
117	0.8		2.5		1	1	
127	-	1.1	-	1.6	5	2	2
137	0.9		2.4		1	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

$L/D:5$, $D_o/D_t:1$

TEST NO. 092 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	6.0/12*	2.5/8.0	21 /52	8.0/35	5/12,3	1	16
125	7.1/12	3.4/7.7	18 /44	6.3/26	11/3	2	16
135	7.5/12	3.8/7.8	20 /44	7.1/26	11/3	2	16
116	3.0/6.8	3.1/14	13 /32	7.1/30	7/7,10,8	2	16
126	3.4/8.0	3.9/18	11 /34	6.1/34	11/3	2	16
136	3.0/8.3	3.1/20	13 /38	7.9/42	11/10,3	2	16
117	1.3/2.9	2.7/16	5.7/19	5.5/33	7,8/11	2	16
127	1.5/2.9	3.6/16	6.0/21	5.8/36	7/11	2	16
137	1.4/3.5	3.3/23	6.3/23	6.3/42	11/11	1	16
118							9
128							9
138							9
119							9
129							9
139							9

* This test produced a double shock in which the trace produced by the primary shock had essentially returned to zero before the arrival of the second shock.

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 054 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-		-		9	1	
125	4.3	1.3	20.2	6.7	11(2)	1	
135	-		-		10(7)(4)	2	
116	2.9		13.3		5(10)	1	
126	2.9	2.8	13.9	8.0	2	1	
136	2.9		14.4		5(2)	1	
117	1.5		8.4		2	1	
127	-	3.6	-	8.9	5	1	2
137	1.4		7.6		2	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 055 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	2.2		5.2		11	1	
125	2.6	0.5	5.3	0.9	10(2)	1	
135	3.1		6.0		9	1	
116	2.0		4.5		1(2)	1	
126	1.7	1.0	4.3	1.4	1	1	
136	1.8		3.8		1	1	
117	1.0		2.7		1	1	
127	-	1.3		1.5	5	1	
137	0.9		2.1		1	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:5, D_o/D_t:0.45

TEST NO. 094 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.6	19	51.0	35	5(12)	1	
125	23.2	22	48.7	32	1	2	
135	29.5	31	51.4	35	1	2	
116	7.6	17	31.3	30	1	1	
126	-	-	-	-	4	1	5
136	9.3	24	34.3	95	1	2	
117	3.0	18	17.3	28	1	1	
127	2.9	16	18.5	31	1	1	
137	3.2	21	19.5	33	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 138 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	14.7	11	41.6	25	4(5)	2	
125	14.3	11	43.1	26	4	2	
135	-	-	-	-	4	2	3
116	-	-	26.7	23	4	2	
126	6.2	12	26.7	22	4	2	
136	6.8	14	28.7	26	4	2	
117	-	-	15.2	23	10(5)	2	
127	2.3	10	15.6	24	5	1	
137	2.4	11	14.2	21	4	1	4
118							9
128							9
138							9
119							9
129							9
139							9

GROUP 8

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

L/D	PROPELLANT WEIGHT (lb)	VELOCITY RANGE	PROPELLANT ORIENTATION	TEST NO.	TERMINAL YIELD (%)	IGNITION TIME (msec)
1.8	200	Low 23 ft/sec	Normal	105	7	0
				152	14	480
				153	14*	121
				184	17	810
				201	26	1524
				225	34	933
		Medium 44 ft/sec	Normal	197	19	500
				203	31	800
				204	42	317
				229	53	1374
				230	21	24
				231	24	525
				251	64	775
				252	38	325
				254	32	533
	1000	Medium 44 ft/sec	Normal	211	12	0
				217	33	1490
				262	42	900
				264	22	21
				266	14	0
	25000	Medium 44 ft/sec	Normal	288C	13	365
				289	4	166
				290	4	105
	200	High 78 ft/sec	Normal	114	54	74
				150	35	40
				151	46	167
				195	104	292
				226	51	283
	1000	High 78 ft/sec	Normal	215	20	20
				216	9	0
5	200	Low 23 ft/sec	Normal	104	6	258
				164	4	125
				165	8	325
			Reversed	103A	39	208
		High 78 ft/sec	Normal	116	10	18
				160	32	67
				161	5	0
			Reversed	113	52	77
				115	15	93

* No impulse because of bad timing.

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 105 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	9.3	5.3	19.7	7.0	1	1	
125	9.6	5.8	17.8	6.0	1	1	
135	10.0	6.2	18.6	6.5	1	1(3)	
116	4.5	6.6	13.2	8.0	1	1	
126	-	-	-	-	-	-	9
136	3.8	4.7	15.2	9.7	1	1	
117	-	-	-	-	11	3	6
127	1.7	4.7	7.5	8.1	1	1	
137	1.8	5.5	7.4	8.0	1	1(8)	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 152 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	13.8	9.9	31.6	16	1(5)	1	
125	15.4	12	30.3	15	1(5)	1	
135	11.5	7.7	33.0	17	1(4)	1	
116	5.9	11	20.8	10	1	1	
126	6.6	12	18.9	13	1	1	
136	5.01	8.0	20.9	16	1	1	
117	2.6	13	12.9	18	1(10)	1	
127	2.7	15	10.6	14	1(5)	1	
137	2.3	9.9	11.3	15	1(4)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 153 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	15.3	12	-	-	4(5)	1	8
125	17.9	15	-	-	1(5)	1	8
135	13.3	9.4	-	-	7(4)	2	8
116	7.2	15	-	-	1(5)	1	8
126	7.4	16	-	-	1(5)	2	8
136	5.1	8.2	-	-	1	1	8
117	2.4	11	-	-	1	1	8
127	2.7	14	-	-	1(5)	2	8
137	2.4	11	-	-	1	1	4,8
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 184 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	32.2	16	4(5)	1	
125	14.9	12	35.3	19	1(4)	1	
135	-	-	-	-	11	2	3
116	-	-	-	-	11(10)	1	
126	6.5	12	21.7	16	4(5)	1	
136	7.7	17	25.4	21	11(10)	1	
117	2.6	13	12.1	17	11(4)	1	
127	3.0	18	12.7	18	11(10,5)	1	
137	3.0	17	12.6	18	4(5)	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 201 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	26.3	26	56.9	12	10	2	
125	33.5	37	50.7	35	12,7	3	6
135	-	-	54.2	38	4	2	12
116	8.8	21	31.7	30	4,5	2,3	
126	12.5	37	25.5	21	12	3	3
136	9.9	25	35.7	37	1	3	14
117	3.5	24	20.1	35	1	1	
127	3.3	21	16.8	27	1	1	
137	3.3	21	16.3	26	1	1	14
118	-	-	-	-	-	-	9
128	1.3	15	11.1	33	4(5)	1	
138	1.5	20	11.2	34	4(5)	1	14
119							9
129							9
139							9

TEST NO. 225 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	17.7	14	38.7	22	4(5)	2,3	12
125	13.4	10	37.3	21	4(5)	1	
135	11.0	7.0	41.1	24	5(4)	1	
116	5.4	9.4	23.8	19	4(5)	2,3	
126	6.5	14	27.2	23	1(4)	2	
136	7.4	16	29.3	27	1(4)	2	
117	3.0	18	17.8	29	1(4)	2	
127	2.8	15	16.7	27	1(4)	1	
137	3.4	22	17.3	28	1(4)	1	
118	1.5	21	11.1	33	1(5)	1	
128	1.5	21	9.6	27	1(4)	1	
138	1.5	19	10.1	30	8	1	
119	0.9	33	7.6	45	8	1	
129	0.9	31	6.3	35	10	1	
139	0.9	30	5.9	32	1(4)	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 197 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	34.3	18	4	2	
125	-	-	35.7	19	4	2	
135	16.6	13	27.2	12	1	1	
116	-	-	21.4	16	4(5)	2	
126	7.9	18	22.2	17	12(4)	1	
136	6.1	12	26.3	23	5	1	
117	-	-	14.7	22	4	1	
127	2.7	15	13.2	19	5	1	
137	2.7	14	12.9	18	5	1	
118	-	-	-	-	5(4)	2,3	10
128	1.4	18	8.6	23	4(5)	2,3	
138	1.3	16	7.7	19	4(5)	2	
119							9
129							9
139							9

TEST NO. 203 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	4	1	
125	-	-	-	-	4	2	
135	29.8	-	40.0	23	4	2	
116	8.8	21	29.1	26	1	1	
126	-	-	29.9	28	4	1	
136	-	-	31.3	30	4	1	
117	3.0	18	18.4	30	1(5)	1	
127	4.2	32	17.5	29	5(4)	1	
137	3.4	23	17.7	29	4	1	
118	-	-	-	-	-	-	9
128	1.9	36	12.8	42	5(4)	1	
138	1.3	15	10.0	29	5(4)	1	
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 204 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	29.7	31	79.7	73	1(4)	1	
125	29.7	31	56.7	42	5	2	
135	21.4	19	55.7	41	4	1	
116	10.9	30	43.5	51	4	1	
126	12.1	35	42.1	47	1(4)	3	
136	11.6	33	45.5	55	1	1	
117	4.7	42	28.5	59	1	1	
127	4.9	44	26.3	52	5(4)	1	
137	4.6	40	25.5	50	1(5)	1	
118	-	-	-	-	-	-	9
128	2.0	40	14.0	48	6	1	
138	1.9	33	13.4	45	6	1	
119							9
129							9
139							9

TEST NO. 229 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.6	17	64.4	52	5	2,3	
125	77.2	112	63.3	51	7,4	2,3	
135	-	-	-	-	-	-	9
116	9.0	23	27.5	25	4(5)	2,3	
126	6.4	12	36.7	38	4	2,3	
136	7.1	15	31.2	29	4	2	
117	3.5	24	20.3	35	5(4)	2	
127	3.5	23	21.4	38	4(5)	2	
137	4.2	35	21.0	38	4(5)	1	
118	1.7	32	10.7	32	4	2	
128	0.7	-	14.5	50	4	2	
138	1.9	33	12.8	42	4	2	
119	1.1	57	9.9	65	9,5,4	1	
129	1.1	54	7.9	48	10(5)	3	
139	1.0	48	7.8	47	1(4)	3	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 230 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	18.3	15	31.8	16	4	2	
125	19.8	17	29.0	14	4	1	
135	15.3	12	39.5	23	4	1	
116	5.6	10	23.0	18	4	2,3	
126	8.0	19	21.2	16	4	1	
136	6.0	11	22.5	18	1	1	
117	2.2	9.0	13.8	20	8	1	
127	2.3	11	13.9	20	5(4)	1	
137	2.5	12	13.3	19	10,11,4	1	
118	1.1	11	7.6	19	1	1	
128	1.3	15	7.8	20	1(4)	1	
138	1.1	11	7.2	18	4,5	1	
119	0.6	14	5.8	31	5	1	
129	0.8	23	5.0	25	10,11,4	1	
139	0.6	13	4.3	20	4(5)	1	

TEST NO. 231 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	24.3	23	34.7	18	5(4)	2,3	
125	19.0	17	40.2	23	12	3	
135	13.3	9.6	39.0	22	5(4)	2,3	
116	7.3	16	23.3	19	4(5)	2,3	
126	11.8	34	25.4	21	12	3	
136	6.9	14	26.2	23	1	1	
117	2.6	13	11.1	15	4	2,3	
127	2.9	17	13.4	19	5(4)	2	
137	3.1	19	15.6	24	1	1	
118	1.3	15	9.3	26	5(4)	2,3	
128	-	-	-	-	-	-	9
138	1.3	15	9.1	25	4(8)	2,3	
119	0.6	14	5.7	30	9,	1	
129	0.8	25	4.9	24	10	1	
139	0.7	20	5.4	28	4	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 251 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	50.3	64	96.0	101	4	2	
125	28.9	30	61.3	48	4	1	
135	-	-	49.9	33	4(7)	1	
116	-	-	47.5	59	5(4)	1	
126	12.1	36	45.0	53	1(4)	1	
136	11.7	-	46.6	57	4	1	
117	5.0	46	27.4	56	4	1	
127	3.3	21	25.6	50	5(4)	1	
137	-	--	-	-	10,5	3	
118	2.?	48	17.2	66	1(5)	1	
128	1.9	36	15.2	54	1(4)	1	
138	-	-	-	-	-	-	9
119	1.1	59	10.8	73	5(4)	1	
129	1.1	56	10.0	67	10,4	1	
139	1.2	60	10.0	67	4	1	

TEST NO. 252 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	25.6	25	53.1	37	1	2	
125	23.6	23	43.4	26	1(4)	1	
135	27.2	27	44.5	27	4	1	
116	9.4	25	33.7	33	4	2	
126	9.0	22	37.8	40	4	2	
136	10.5	29	39.3	43	4	2	
117	3.9	29	19.5	34	4(5)	1	
127	3.5	24	19.7	34	4(5)	1	
137	4.2	35	19.9	35	10,4	1	
118	1.9	35	12.3	39	4(5)	1	
128	1.6	24	10.3	31	1,4	1	
138	-	-	-	-	-	-	9
119	0.9	34	7.0	41	1(4)	1	
129	0.9	36	6.8	39	10(4)	1	
139	1.0	38	6.8	39	4(5)	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 254 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.3	17	41.9	24	4	1	
125	19.3	17	38.4	21	4	1	
135	14.6	11	37.7	21	1	1	
116	8.5	20	28.9	26	4(5)	1	
126	8.1	19	33.6	33	11.4	1	
136	7.5	13	29.0	26	4(5)	1	
117	3.2	20	17.9	29	5(4)	1	
127	3.1	19	16.7	27	1(4)	1	
137	-	-	6.1	6.0	1(4)	3	2
118	1.7	26	10.6	32	1(4)	1	
128	1.5	22	10.2	30	5(4)	1	
138	-	-	-	-	-	-	9
119	0.8	28	6.4	35	1(4)	1	
129	0.9	29	6.4	36	1(4)	1	
139	0.8	28	6.1	34	1(4)	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 211 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	23.2	4.3	76.0	14	4(5)	3	
125	32.1	7.1	63.3	10	1(5)	1	
135	23.6	4.5	95.3	20	11,8		16
116	8.8	4.3	46.9	12	11,8		16
126	9.3	4.7	53.7	15	11,8	2,3	16
136	7.9	3.6	53.3	15	8	2,3	16
117	3.4	4.0	28.5	12	8,3	2	
127	3.1	3.7	26.1	10	8	2,3	16
137	4.2	6.6	35.1	15	1	3	
118	2.4	9.7	21.3	18	8	2	
128	1.8	6.6	20.4	17	8	1	
138	1.6	4.4	19.9	16	4,5	2	
119							9
129							9
139							9

TEST NO. 217 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	189	69	293	140	4(7)	3	
125	-	-	-	-	4(7)	1	
135	36.5	8.4	109	26	4(5)	1	
116	-	-	-	-	4(7)	1	
126	-	-	-	-	4(7)	1	
136	23.6	18	157	53	4(5)	3	
117	4.8	8.5	-	-	4	2,3	
127	4.0	6.3	57.2	35	4	2,3	
137	11.3	36	58.9	37	4	2	3
118	-	-	-	-	8,4	1	
128	1.4	3.4	35.3	37	4	3	12
138	3.1	20	32.2	37	4(5)	3	
119	1.5	21	23.0	45	4,5,8	3	
129	1.8	31	21.0	40	4(5)	3	
139	1.5	20	21.7	42	5,8,4	3	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 262 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	60.2	16	159	47	5(4)	2	
125	81.7	24	184	62	4(7)	2,3	
135	163	57	206	75	4(7)	3	
116	23.0	19	92.0	37	12,4,5	2	
126	28.6	26	91.2	36	4	2	3
136	26.6	34	86.2	33	1(4)	1	
117	10.1	31	66.8	45	1(4)	1	
127	10.1	31	54.8	33	7(4)	2	
137	-	-	-	-	4(5)	1	2
118	4.4	39	40.0	45	1(5)	1	
128	4.2	36	35.3	37	1(4)	1	
138	4.1	35	39.7	45	1(4)	3	
119	2.0	42	25.8	54	4(5)	1	
129	1.9	34	22.9	45	4(5)	1	
139	1.9	37	22.1	43	4(5)	3	

TEST NO. 264 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	56	15	79	15	11	2	
125	33.8	7.6	76	14	9,4	1	
135	45	11	103	23	12	1	
116	21	17	69	22	12,5	2	
126	12	7.2	58	16	11,3	2	
136	16	11	63	19	11	1	
117	5.5	11	33	15	11(4)	2	
127	4.6	8.0	39	19	11,12(4)	2	
137	-	-	-	-	11,8	1	2
118	2.5	13	31	31	8(4)	2	
128	2.5	13	23	20	1	2	
138	2.5	13	25	23	8,4	1	
119	1.2	13	20	36	8,4,11	2	
129	1.4	17	14	21	3,11	2	
139	1.3	16	16	26	11(4)	2	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 266 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	28.3	5.8	60.2	8.7	1(4)	2	
125	-	-	-	-	-	-	9
135	35.3	7.9	56.8	7.9	4	1	
116	11.2	6.5	48.8	12	12,8	2	
126	16.6	11	57.0	15	4	2,3	
136	9.4	4.9	54.7	15	1(4)	2,3	
117	4.1	6.5	38.9	19	8	1	
127	3.9	5.9	44.3	23	5(4)	2,3	
137	-	-	-	-	8	1	2
118	1.9	7.0	21.6	17	5(4)	1	
128	1.8	6.5	21.3	17	4	2	
138	1.8	6.4	22.7	19	8(4)	2	
119	0.9	7.4	14.6	22	4(8)	1	
129	0.9	6.7	13.8	20	5(4)	2,3	
139	0.9	6.8	13.0	19	4,8	2	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 288C PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	40	9.8	141	6.4	5	1	
127	36	8.4	211	13	5	1	
137	38	8.9	214	13	7,3	1	
118	15	12	128	11	4	1	
128	12	9.0	129	11	5	1	
138	14	12	148	14	3,4	2	
119	5.8	13	85	12	4	1	
129	5.8	13	91	13	4	1	
139	-	-	-	-	-	1	15,2
110	2.3	10	54	14	4,2,8	1	
120	2.1	8.6	46	11	5,2	1	
130	2.2	9.7	51	13	4,2	1	
111	1.0	9.2	30	15	4,7	1	
121	1.0	9.8	31	15	1,2	1	
131	1.2	13	33	17	7,2	1	

TEST NO. 289 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	16	2.4	33	0.6	4	1	15,2
127	16	2.4	112	4.3	5	1	
137	13	2.0	244	16	4,3	1	
118	5.8	2.5	70	4.3	1	1	
128	6.0	2.8	57	3.2	1	2	
138	6.9	3.6	74	4.6	3	1	
119	2.5	2.5	42	4.4	8	1	
129	2.3	2.3	40	4.1	1	2	
139	2.6	2.9	41	4.3	3	1	
110	1.2	2.2	26	4.7	4	1	
120	-	-	-	-	-	-	9
130	1.2	2.2	26	4.8	4	1	
111	0.6	3.1	15	5.4	4,5	1	
121	-	-	-	-	-	-	9
131	0.6	3.1	14	5.0	7,3	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Medium Velocity

TEST NO. 280 PROPELLANT WT. 25000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117	13	1.9	159	7.9	5	1	2,15
127	15	2.2	115	4.4	1	1	2,15
137	-	-	-	-	-	-	9
118	6.4	3.0	99	7.3	1	2	
128	4.4	1.6	89	6.2	5	2	
138	6.5	3.1	84	5.7	4	2	
119	2.6	2.8	48	5.4	8,4	1	
129	2.0	1.6	[illegible]	4.4	8	2	
139	2.6	2.9	55	6.6	4,3	2	
110	1.2	2.1	30	6.0	4	2	
120	1.0	1.4	26	4.8	7,5	2	
130	1.2	2.5	30	5.9	4,7	2	
111	0.5	1.7	14	5.2	2,10	1	
121	0.5	1.8	15	5.6	1	1	
131	0.5	2.7	17	6.3	2,4	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 114 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	30.2	32	65.0	53	4(5)	1	
125	26.1	26	63.4	52	4	1	
135	32.2	35	67.6	57	4(5)	2	
116	57.2	52	46.4	57	1	1	
126	14.6	48	48.8	61	1(2)	1	
136	14.4	47	48.6	62	1(2)	1	
117	5.6	56	25.4	49	1	1	
127	5.3	51	28.1	58	5	1	
137	5.4	52	27.9	58	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 150 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	26.8	27	51.1	35	4	1	
125	28.3	29	55.3	40	1	1	
135	25.7	25	58.1	44	4	2	
116	10.0	26	37.1	40	12(4)	1	
126	9.9	26	37.8	40	4	1	
136	9.1	23	37.8	40	1	1	
117	3.9	30	21.6	40	10(4)	1	
127	4.2	34	20.9	38	4(5)	1	
137	4.0	31	20.8	37	4	1	4
118							9
128							9
							9
138							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 151 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-SEC	% YIELD	SHAPE	BASELINE	
115	22.4	20	-	-	5(1)	1	
125	25.7	25	64.1	52	1(4)	2	
135	23.7	23	60.2	47	1(7)	2	
116	11.5	33	-	-	4(5)	1	
126	11.9	31	41.4	53	1(1)	1	
136	11.5	33	43.7	51	1(4)	1	
117	4.5	38	24.9	48	1(4)	1	
127	-	-	25.1	50	4(5)	1	
137	-	-	24.7	47	5(1)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 195 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	42.2	50	83.8	80	1	1	
125	59.4	80	84.5	82	7	2	
135	45.3	55	63.1	51	4	2	
116	13.1	41	56.9	79	4	1	
126	13.2	41	48.9	61	4	1	
136	12.0	36	57.7	83	4	1	
117	6.3	70	32.9	73	1	1	
127	5.0	46	31.8	69	4,6	1	
137	5.0	45	30.1	64	4	1	
118	-	-	-	-	-	-	9
128	3.2	110	24.6	109	1(1)	1	
138	2.9	86	24.7	111	1(1)	1	
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 226 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	-	-	
125	48.1	76	47.4	31	12,4	1	
135	18.6	16	55.1	40	4	2	
116	6.1	12	31.1	29	4	2,3	
126	6.7	13	36.1	37	4	2,3	
136	11.1	31	42.4	48	4	2,3	
117	4.3	35	20.5	36	4	2	
127	3.8	28	20.0	35	4	2	
137	4.0	31	21.5	39	1(4)	2	
118	2.0	41	12.3	39	1(4)	1	
128	-	-	14.3	49	9	1	2
138	1.6	25	12.2	39	8	1	
119	1.2	67	9.4	61	8,10	1	
129	1.0	48	7.4	44	10	1,3	
139	0.9	46	7.1	41	4	1,3	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 215 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	58.2	16	82.6	16	1	1	
125	49.8	13	65.3	11	1(5)	3	
135	52.2	14	85.5	17	4(5)	1	
116	16.4	12	69.7	23	1(5)	1	
126	14.6	9.3	72.9	24	11,5	2,3	
136	16.6	12	68.2	22	1(8)	1	
117	5.4	11	46.6	25	4,5	1	3
127	4.7	8.3	46.6	26	8,4	2,3	
137	5.8	12	50.3	29	4(5)	2,3	
118	2.5	13	26.9	25	4(5)	2	
128	2.5	13	29.0	28	4(5)	3	
138	2.2	10	30.2	30	4(5)	3	
119	1.3	14	16.1	26	4(5)	3	
129	1.2	13	16.5	27	8	1	3
139	1.2	12	17.3	30	8,(4)	1	

TEST NO. 216 PROPELLANT WT. 1000 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	28.4	5.7	58.2	8.8	1(8)	1	
125	26.5	5.3	57.4	8.5	1(8)	3	
135	27.8	5.7	46.0	5.8	1	1	
116	11.6	6.7	31.6	6.9	4(8)	1	
126	8.9	4.3	41.9	9.4	11(8)	1	
136	7.6	3.4	42.8	10	8	1	
117	3.7	5.3	27.8	12	8,4	1	
127	3.3	4.1	31.1	11	8(4)	1	
137	4.0	6.1	33.8	15	4	1	
118	1.8	6.5	18.3	14	8(4)	1	
128	1.6	4.7	16.8	13	4(8)	1	
138	1.5	3.9	15.2	11	4	1	
119	-	-	-	-	9	1	2
129	0.9	6.0	10.5	14	8	1	
139	0.7	3.4	10.1	13	8	1	

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5.1, Low Velocity

TEST NO. 104 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	8.5	4.5	16.6	5.3	(5)	1	8
125	9.2	5.4	16.4	5.3	1	2	8
135	9.9	5.9	17.3	5.7	1	2(3)	8,6
116	4.3	6.2	12.2	6.9	1	1	8
126	4.1	5.6	13.1	7.6	1	1	8
136	3.8	4.9	12.4	7.0	1	1	8
117	-	-	-	-	11	3	8,6
127	1.8	5.6	6.6	6.7	1	1	8
137	1.6	4.2	6.0	5.9	1	1	8,4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 164 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	6.7	3.0	15.0	4.6	1(5)	1	
125	5.5	2.2	15.3	4.8	1(5)	1	
135	-	-	-	-	3,11	2	3
116	2.8	2.7	9.2	4.6	1	1	
126	2.5	2.0	9.6	4.8	1(8)	1	
136	2.7	2.6	9.1	4.5	1(11)	1	
117	-	-	-	-	-	-	9
127	-	-	-	-	-	-	9
137	1.4	3.1	5.1	4.6	1	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, Low Velocity

TEST NO. 165 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.7	6.6	23.7	9.7	4(5)	1	
125	11.0	7.1	25.4	11	1(5)	1	
135	-	-	-	-	3	2	3
116	4.4	6.4	15.4	9.9	1	1	
126	4.4	6.3	14.8	8.9	1	1	
136	4.8	7.4	17.4	12	11(5)	1	
117	2.0	7.1	8.2	9.2	1	1	
127	2.1	8.4	8.5	9.6	4(5)	1	
137	2.1	8.0	8.7	10	4(5)	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, Low Velocity, Reversed Propellant Orientation

TEST NO. 103A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	18.9	16	58.7	44	4	1	
125	23.0	22	62.8	51	3,12	2	3
135	23.5	22	60.4	44	3	2	3
116	11.1	31	43.6	51	1(12)	1	
126	10.8	30	44.7	53	1	1	
136	10.7	30	37.3	40	9,3	1	
117							6
127	4.0	30	26.4	52	10	2	
137	3.8	28	23.6	45	10	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, High Velocity

TEST NO. 116 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.8	6.8	29.6	14	1	2	
125	10.6	6.7	23.4	9.7	1	1	
135	10.5	6.5	24.9	11	1(11)	1	
116	4.8	7.4	16.0	10	1	2	
126	5.1	8.2	16.1	10	1(10)	1	
136	5.7	9.9	20.5	15	1	1	
117	2.1	8.4	9.3	11	1(11)	2	
127	2.1	8.0	8.6	10	1(10)	1	
137	2.2	9.0	9.2	11	1	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 160 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	47.8	31	4(5)	1	
125	-	-	52.1	37	4	1	
135	24.8	24	49.2	33	4	2	
116	9.5	25	33.7	34	1	1	
126	10.1	26	33.3	33	1(4)	1	
136	9.2	23	34.5	35	1(5)	1	
117	4.2	33	18.9	32	10(4)	1	
127	4.2	34	19.1	32	4(5)	1	
137	4.0	31	19.6	33	1(4)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, High Velocity

TEST NO. 161 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	8.1	4.3	16.5	5.3	4(5)	2	
125	9.4	5.6	21.5	8.2	1	1	
135	-	-	-	-	3(5)10	2	3
116	3.9	5.1	10.8	5.7	1	2	
126	-	-	-	-	1(4)	2	10
136	-	-	-	-	11(5)	2	
117	1.6	4.5	6.2	5.9	1(5)	1	
127	1.6	4.2	6.6	6.6	4(5)	1	
137	1.8	5.6	5.8	5.5	1(4)	2	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 V CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:5, High Velocity, Reversed Propellant Orientation

TEST NO. 113 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	42.1	50	66.0	54	4(10)	1	
125	34.8	39	70.1	60	4	2	
135	39.4	47	75.3	68	4	2	
116	13.8	44	49.7	64	5(12)	2	
126	14.3	46	51.7	68	5	2	
136	14.3	49	51.0	67	5	2	
117	5.0	45	26.9	54	5	2	
127	4.8	42	29.9	64	5	2	
137	5.0	45	30.1	64	5	2	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 115 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-			11(9)
125	9.6	5.6	36.6	20	1(5)	3	7
135	10.4	6.5	34.7	18	9(10)	3	7
116	5.0	7.9	25.9	22	5,4	1	
126	5.1	8.0	29.1	26	1(4)	1	
136	4.5	6.6	26.0	23	9	1	
117	1.9	6.6	14.1	20	11,12,4	1	
127	2.4	11	14.9	23	10,11,12	1	
137	2.2	9.0	13.1	19	11,12	1	4
118							9
128							9
138							9
119							9
129							9
139							9

GROUP 9

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE - HORIZONTAL TESTS
(All tests 200-lb Propellant Weight)

PROPELLANT TYPE	VELOCITY RANGE*	PROPELLANT ORIENTATION	TEST NO.	TERMINAL YIELD (%)	1ST PROP. TO 2ND PROP.	2ND PROP. TO IGNITION
LO_2/LH_2	Low 23 ft/sec	Normal	131	6	441	125
			132	5	0	0
			133A	6	289	286
			185	8	469	0
			186	9	597	61
			223	18	708	157
			224	16	621	399
	High 78 ft/sec	Normal	183	15	448	0
			196	17	639	77
			228	34	560	42
			253	57	561	108

* Velocity shown for top propellant only. Bottom propellant velocity ~12 ft/sec for all tests.

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 131 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	7.4	3.6	20.1	7.4	1(4)	2	
125	7.2	3.4	19.8	7.2	1(10)	2	
135	7.5	3.7	17.7	6.0	1(4)	2	
116	4.0	5.2	13.0	7.6	1(5)	1	
126	3.7	4.4	13.0	7.6	1(4)	2	
136	3.7	4.6	13.8	8.4	1(4)	2	
117	1.8	5.5	6.7	6.8	1(5)	1	
127	1.7	5.1	7.2	7.8	1(10)	1	
137	1.6	4.2	6.8	7.0	1(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 132 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	8.4	4.5	18.5	6.4	5	1	
125	7.8	4.0	18.5	6.4	4	1	
135	8.6	4.8	-	-	4	2	3
116	3.7	4.7	11.1	5.9	1	2	
126	3.4	3.8	11.7	6.5	1	1	
136	3.2	3.6	11.5	6.4	1	1	
117	1.5	4.2	6.0	5.8	1(9)	1	
127	1.6	4.4	6.4	6.4	9,(5)	1	
137	1.5	3.6	5.9	5.7	1(9)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 133A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	9.5	5.5	22.4	8.7	1(5)	1	
125	8.1	4.2	26.2	11	1	1	
135	9.4	5.6	20.1	7.3	1(5)	2	3
116	3.8	4.8	14.8	9.0	1	1	
126	4.0	5.3	16.0	10	1	1	
136	3.7	4.6	16.3	11	1(5)	1	
117	1.5	4.1	7.3	7.9	1(4)	1	
127	-	-	-	-	3(11)	2	3
137	-	-	7.9	9.0	1(4)	1	
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 185 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	8.5	4.6	21.0	7.9	4(5)	1	
125	-	-	-	-	1	1	10
135	8.7	4.7	20.4	7.6	4(5)	1	
116	-	-	14.0	8.5	4(5)	1	
126	4.1	5.6	15.4	9.7	1(5)	1	
136	4.0	5.5	13.8	8.4	11(12)	1	
117	1.7	5.5	8.04	9.0	10(11)	1	
127	1.8	5.8	9.6	12	10(5)	1	
137	1.8	5.6	7.9	9.0	1(4)	1	
118							9
128							9
138							9
119							9
129							9
139							9

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 186 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	10.6	6.6	23.0	9.0	4	1	
125	11.3	7.4	23.6	9.7	1	1	
135	10.6	6.7	25.2	11	11(12)	1	
116	4.8	7.7	16.0	11	1(11)	1	
126	4.7	7.1	15.1	9.5	1(5)	1	
136	4.8	7.7	16.1	11	11(12)	1	
117	2.1	8.3	8.4	9.6	10(5)	1	
127	2.2	8.8	8.4	9.5	10(5)	1	
137	2.1	8.8	9.0	11	1(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 223 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	13.7	9.8	-	-	5	2,3	
125	15.3	12	26.0	11	11,5	1	
135	13.3	9.6	28.6	13	1	1	
116	5.2	8.6	-	-	11,12,5	2,3	
126	6.0	11	23.7	19	11,12	2	
136	5.3	8.7	22.6	18	1(5)	2,3	
117	2.3	10	-	-	5,8	2,3	
127	2.3	10	9.6	12	5,8	2	
137	2.7	15	6.8	7.0	9,8	1	
118	-	-	-	-	3	2	
128	1.3	15	6.6	16	1	1	
138	1.3	14	6.8	17	4,5	2	
119	-	-	-	-	9	2	
129	0.7	18	4.4	21	10	2	
139	0.6	15	3.6	16	1(4)	2	

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

TEST NO. 224 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	21.5	23	42.9	26	1(4)	2	
125	9.2	5.4	28.6	13	1	1	
135	11.2	7.1	35.1	19	1(4)	1	
116	7.0	15	20.7	16	12,4	2,3	
126	5.2	8.4	21.2	16	1(4)	2,3	
136	6.0	12	22.1	17	1(4)	1	
117	2.9	17	15.5	24	4	2,3	
127	2.1	8.3	12.1	16	1(8)	1	
137	2.8	16	13.1	19	9	3	
118	1.3	14	6.9	17	1(5)	1	
128	-	-	-	-	9	1	2
138	1.2	14	7.4	19	1(5)	1	
119	0.4	6.2	3.2	13	9	1	
129	0.6	14	4.1	20	4,5,9	1	
139	0.7	22	4.6	23	4(5)	1	

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 183 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	4(5)	1	
125	17.1	14	36.4	20	4	1	
135	17.5	15	-	-	3,12	2	3
116	-	-	-	-	10,11,12	2	
126	6.6	15	21.9	17	4(5)	1	
136	6.9	14	26.3	23	11,9	1	
117	2.5	13	11.8	16	4,5,8	2	
127	2.6	13	12.5	18	10,5,4	1	
137	2.7	15	12.8	18	4	1	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 196 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	19.2	16	41.1	24	1(4)	2	
125	16.8	14	41.8	25	1(12)	2	
135	15.4	12	36.5	20	1	1	
116	6.3	12	22.3	17	1(5)	2	
126	6.3	12	22.5	17	1(12)	2	
136	6.7	13	23.5	19	1(4)	2	
117	2.5	12	13.0	18	1(4)	1	
127	2.7	15	12.3	17	5	1	
137	2.2	14	11.9	16	1	2	
118	-	-	-	-	-	-	9
128	1.2	12	7.4	18	1(4)	1	
138	1.2	14	8.1	21	1(4)	1	
119							9
129							9
139							9

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, High Velocity

TEST NO. 228 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	27.0	27	49.5	33	4(5)	2,3	
125	26.4	26	60.6	47	1(12)	1	
135	23.5	22	48.5	32	1(4)	1	
116	8.9	23	32.9	32	4(5)	2,3	
126	9.3	24	32.2	31	1	2,3	
136	-	-	-	-	-	-	9
117	3.7	26	18.1	30	4(5)	2,3	
127	3.5	23	19.5	33	4(5)	2,3	
137	4.0	31	20.8	37	11,8	2,3	
118	1.7	27	12.8	42	5(4)	1	
128	1.8	30	12.2	39	9	1	
138	1.8	31	11.1	34	8	1	
119	0.8	22	-	-	8	1	8
129	0.9	32	-	-	10,11	1	8
139	0.9	31	-	-	1(4)	1	8

TEST NO. 253 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	27.4	28	67.2	56	1(4)	2	
125	25.9	26	55.0	40	4(5)	1	
135	25.7	25	57.2	42	4(5)	2,3	
116	13.8	45	42.0	49	4(5)	2	
126	9.6	24	44.9	54	12,4,5	1	
136	10.5	29	54.8	76	4(5)	1	
117	4.4	44	25.3	50	5(4)	1	
127	4.0	31	23.0	42	5,(4)	2,3	
137	-	-	-	-	10(4)	2	2
118	2.1	45	16.0	58	4(5)	2	
128	1.0	35	13.9	48	4(5)	1	
138	-	-	-	-	-	-	9
119	1.0	53	9.9	65	4(5)	1	
129	1.1	56	8.5	53	10,4	3	
139	1.1	58	9.1	58	4(5)	1	

GROUP 10

LO_2/LH_2 SPECIAL TESTS
(All tests 200-lb Propellant Weight)

TEST TYPE	TARGET TYPE	IMPACT VELOCITY (ft/sec)	TEST NO.	TERMINAL YIELD (%)	IGNITION TIME (msec)
High-Velocity-Impact	Flat Wall	597	079	121	-
	Deep Hole	569	080	163	-
Pool Tests	-	**	233	109	2182
Horizontal-Horizontal	-	**	242	107	800
Confinement-by-the-Missile* $(D_o/D_t = 0.083)$	-		169	15	318
	-		173	15	56

* Scaled S-IV.

** Bottom propellant 0, top propellant ~23 ft/sec.

LO_2/LH_2 HIGH-VELOCITY-IMPACT

L/D:1.8, Flat Wall

TEST NO. 79 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115							9
125							9
135							9
116	32.6	119	97.5	200	12	1(2)	
126	16.9	45	63.1	96	12	1	
136							9
117	8.9	113	48.6	147	12	1	
127	7.0	69	40.0	104	12	1	
137	5.3	41	32.7	75	12	1	
118	3.3	113	27.6	133	1(5)	1	
128	2.3	53	27.8	131	1	1	
138	2.6	62	19.2	70	12	1	
119	1.8	178	17.7	146	1(10)	1	
129	1.3	75	13.8	91	3	1	
139	1.4	84	12.8	80	1(10)	1	

LO_2/LH_2 HIGH-VELOCITY-IMPACT

L/D:1.8, Deep Hole

TEST NO. 80 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115							9
125							9
135							9
116	60	250	149.4	371	7	1(2)	
126	13.6	34	66.1	112	12	1	
136							9
117	14.3	214	75.1	291	7,5	2	
127	6.6	65	47.3	139	12	1	
137	3.5	21	31.4	70	12	1	
118	4.6	208	35.8	196	7,5	2	
128	2.6	65	33.6	176	5	1	
138	1.8	29	16.1	54	12	1	
119	2.1	250	23.5	227	10	2	
129	1.4	86	16.8	125	3	1	
139	1.2	63	13.5	86	10	1	

LO_2/LH_2 H CONFINEMENT-BY-THE-GROUND-SURFACE

L/D:1.8, Low Velocity

Pool Tests

TEST NO. 233 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	33.4	19	-	-	2,3	2,3	
125	21.1	19	80.4	76	4	2,3	
135	26.6	27	59.6	45	4,2	2,3	
116	14.1	46	-	-	4,2,3	2,3	
126	7.4	16	47.3	58	4(5)	2,3	
136	12.6	38	45.7	55	4(5)	2,3	
117	6.2	67	39.1	97	4(8)	2,3	
127	3.9	30	29.5	62	4	2	
137	8.2	109	39.1	97	4(10)	2,3	
118	3.3	112	-	-	5,2,3	2,3	
128	2.0	40	18.9	75	4(5)	1	
138	2.8	82	22.4	96	4(9)	2	
119	1.5	109	13.8	106	5,8	1	
129	1.1	58	14.0	109	10	1	
139	1.4	90	14.1	110	1(4)	1	

TEST NO. 242 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	42.0	50	115.0	136	4,3	2	
125	46.1	58	88.0	88	12(4)	2	
135	57.1	67	79.0	73	4,5	2	
116	-	-	58.2	83	4,5	2	
126	-	-	70.7	113	4(12)	2	
136	20.0	79	72.4	118	4	2	
117	6.2	69	40.2	101	1(4)	2	
127	-	-	37.3	89	4(5)	2	
137	-	-	41.4	105	9	2	
118	2.7	72	23.6	105	4(5)	1	
128	2.9	84	22.9	98	4	1	
138	2.8	83	23.1	101	8	1	
119	1.5	104	15.1	121	9	1	
129	1.6	111	13.9	108	10	1	
139	1.5	96	13.6	104	4	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE

L/D:1.8, $D_o D_t$:0.083

TEST NO. 169 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	-	-	4	2	
125	12.2	8.4	40	23	4(5)	1	
135	13.5	9.6	-	-	11	2	3
116	4.7	7.3	26.2	23	1	2	3
126	-	-	-	-	10,4,8	1	
136	5.1	8.4	26.2	23	4(5)	2	
117	2.1	8.7	14.6	22	4	2	
127	-	-	14.8	22	4(5)	1	
137	2.2	9.4	14.1	21	4	2	4
118							9
128							9
138							9
119							9
129							9
139							9

TEST NO. 173 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
115	-	-	34.4	18	4	1	
125	8.3	4.5	38.9	22	1(5)	1	
135	9.3	5.4	-	-	4	2	2
116	-	-	-	-	12,11	1	1
126	3.8	4.8	26.4	23	1	1	1
136	3.8	4.9	26.1	23	1(4)	1	1
117	1.6	4.6	16.3	26	1(8)	1	
127	1.8	5.8	15.7	24	1(5)	1	
137	1.9	6.7	14.4	21	1(5)	1	4
118							9
128							9
138							9
119							9
129							9
139							9

GROUP 11

SPECIAL TEST (SCALED TWO-STAGE VEHICLE)

CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TEST

L/D: 1.8 Medium Velocity (44 ft/sec) Terminal Yield 70%

TEST NO. 295 PROPELLANT WT. { 1000-lb LO_2/RP-1 ; 200-lb LO_2/LH_2 } IGNITION TIME 544 msec

STATION NUMBER	PRESSURE		IMPULSE		TRACE CHARACTERISTICS		REMARKS
	PSI	% YIELD	PSI-MSEC	% YIELD	SHAPE	BASELINE	
117							
127							
137							
118							
128							
138							
119							
129							
139							
110	1.4	68			3	1(2)	
120	1.5	77			5	1(2)	
130	1.4	71			5	1(2)	
111	0.6	54	10.4	68	3,7	1	
121	0.6	53	12.3	87	3,8	1(2)	
131	0.6	71	12.3	87	3,5	1(2)	

Group 12

CLOSE-IN BLAST DATA

In the previous subsections, 1 through 11, the blast data from the five primary gauge distances have been reported. During the program a limited effort was expended to acquire peak overpressure and positive phase impulse data close in to the propellant explosion. The gauge distances used to acquire this data are listed below:*

Gauge Number	Distance
121	2.75 ft from ground zero on pad
132	4.5 ft from ground zero on pad
113	6.5 ft from ground zero on pad
123	12.8 ft directly above ground zero on drop tower
104	12.8 ft from ground zero on pad
114	12.8 ft from ground zero on pad
124	12.8 ft from ground zero on pad
134	12.8 ft from ground zero on pad
115	23 ft from ground zero on pad
125	23 ft from ground zero on pad
116	37 ft from ground zero on pad
126	37 ft from ground zero on pad

* As in the previous subsections the gauge numbers are coded to indicate: the type of measurement, first digit, i.e., 1 = side-on pressure; the gauge line, second digit, i.e., 1 = 299°, 2 = 59°, and 3 = 179° and the nominal distance (third digit) as noted in the list above.

Group 2

HYPERGOLIC (AFRPL) TESTS

TEST NO. 031 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
123	-	-	3	2	
114	-	-	-	-	15
124	-	-	-	-	15
133	-	-	3	2	
134	2	3	3	2	

TEST NO. 032 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	8	10	4	1	
132	4	8	3	1	
113	-	-	-	-	9
123	5	8	1	1	
114	2	4	3	1	
124	3	3	1	2	

TEST NO. 035 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	3	4	9	1	
132	4	5	1	1	
113	4	3	9,11	1	
123	3	3	4,8	1	
114	-	-	-	-	9
124	2	2	4	1	

HYPERGOLIC (AFRPL) TESTS

TEST NO. 019 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	2,200	154	1	1	
132	1,660	87	1	1	
113	544	85	7	1	
123	-	-	12,5	2	
114	82	58	7	1	
124	65	-	3	1	

TEST NO. 030 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,800	124	11	1	
132	1,100	85	7,4	1	
113	445	85	7	1	
123	-	-	-	-	9
114	90	49	12	1	
124	-	-	-	-	9

TEST NO. 029 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	70	-	10	2	
113	16	-	3	2	
123	24	6	11,5	2	
114	5	11	4,3	2	
124	3	-	3	2	

HYPERGOLIC (AFRPL) TESTS

TEST NO. 036 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	8	12	7,4	1	
132	7	10	4	2	
113	1	5	3,7,8	1	
123	4	8	4	2	
114	-	-	3	2	
124	2	4	12	2	

TEST NO. 033 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	130	98	3,8	1	
132	48	60	3,8	1	
113	38	37	4	1	
123	44	50	7,10	1	
114	16	29	7,4,10	1	
124	24	33	7	1	

TEST NO. 037 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	2,600	180	1	1	
132	380	28	11,3	1	
113	-	-	-	-	9
123	-	56	3	1	
114	-	-	-	-	9
124	50	42	3,4	1	

HYPERGOLIC (AFRPL) TESTS

TEST NO. 158 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	11	11	1(3)	1	
132	-	-	-	-	
113	4	6	12,9,3	1	
123	-	-	-	-	
114	2	3	4,9	1	
124	2	4	4,9	1	

TEST NO. 159 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	15
132	-	-	-	-	15
113	-	-	4,8	1	
123	4	8	4	1	
114	2	5	4,9	1	
124	2	5	4,9,10	1	

TEST NO. 189 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	2	18	4	1	15
124	5	16	4	2	15

Group 3

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 042 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	560	148	6(2)	1	
123	410	146	1(2)	2	
114	180	104	12	1	
124	160	117	12(7)	1	

TEST NO. 058 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	12(7)	1	
113	-	-	12(2)	1	
123	-	137	12(7)	1	
114	-	-	12,3	1	
124	120	86	12(7)	1	

TEST NO. 086 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	512	-	4(2)	3	
132	452	100	1(7)	2	
113	241	111	1(12)	2	
123	176	99	5(7)	2	
114	57	52	5(2)	2	
124	64	46	1(2)	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 044 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	300	124	12(7)	1	
133	-	135	6(7)	1	
114	-	-	12(7)	1	
134	70	58	12(5,2)	1	

TEST NO. 087A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	463	95	5(2)	1	
113	188	74	7	2	
123	189	73	1	2	
114	58	62	10(2)	2	
124	58	46	1(2)	1,2	

TEST NO. 095A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	289	143	4,12	2	
132	480	167	12	2	
113	132	102	12,7,4	2	
123	150	109	12,7	1	
114	64	67	12	2	
124	64	54	12	1	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 101 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	560	315	12,7	1	
132	503	171	12	2	
113	237	137	12,3	1	
123	218	147	12,7	1	
114	75	104	12	2	
124	-	-	10,7,3	2	

TEST NO. 237 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	216	28	7	-	
113	283	135	7,12	1	
123	139	72	4	1	
114	73	38	7,11,12	1	
124	-	50	4	1	

TEST NO. 238 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	341	37	12	1	
113	153	73	10	3	
123	146	7	11	3	
114	45	-	12	2	
124	57	46	12	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 239 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	362	25	7	1	
113	264	167	10	1	
123	182	110	4	1	
114	118	-	10,12	2,3	
124	103	86	7,12	2,3	

TEST NO. 174 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	480	-	4,7	1	
132	293	-	11,4,7,12	1	
113	328	197	12,7,3	1	
123	-	-	10,4	1	
114	141	106	10,12,3	1	
124	128	90	12,3	1	

TEST NO. 240 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	608	-	7	3	
113	406	191	4	3	
123	189	69	4	3	
114	137	122	1	2,3	
124	-	56	7,4,5	2,3	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 192 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	1,065	584	4(2)	2	
113	255	242	4	1	
123	180	206	4,2,10	2	
104	41	41	10(11)	2	
114	93	88	1(4)	2	
124	93	81	4(11)	3,2	

TEST NO. 193 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	414	343	11,3	1	
113	-	-	4,7,3	1	
123	-	-	11,3	1	
104	116	94	12,3	1	
114	89	100	4,7	1	
124	103	94	12,7	1	

TEST NO. 209 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	836	-	12,3	1	
113	340	-	12,7	2	
123	-	-	7,3	3	
104	-	-	-	-	
114	-	-	12,3,4	2	
124	139	89	7,3	3	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 270A PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	-	-	-	-	
123	335	96	11	1	
114	136	117	12,5	1	
124	141	119	10,12,3	1	

TEST NO. 275 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
134	-	-	2	2	
115	36	167	8,2	2	
125	27	139	5,2	2	
116	-	-	-	-	
126	-	-	-	-	

TEST NO. 278 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
123	-	-	-	-	
114	949	698	7,4,3	1	
115	393	-	-	1	
125	277	503	7,4	1	
116	229	-	-	-	
126	-	248	-	-	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 282 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
123	-	-	-	-	
134	1,038	813	12,3	1	
115	369	-	2,4,7	1	
125	386	855	2,4,7	1	
116	160	-	4,2	1	
126	127	533	8,2	1	

TEST NO. 047 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	-	-	12	2	
123	145	80	7(6)	1	
114	35	-	5(7)	1	
124	-	33	9(7,10)	-	

TEST NO. 049 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	290	89	12(3)	1	
123	200	82	4(5)	1	
114	-	-	5(6,7)	1	
124	68	37	12	2	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 085 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	472	133	4(5)	2	
132	502	113	1(11)	1	
113	221	79	7(2)	2	
123	218	88	4,5,7	2	
114	51	49	10(11)	2	
124	-	-	-	-	

TEST NO. 046 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	
132	-	-	-	-	
113	-	-	1(12)	1	
123	235	117	7	-	
114	-	-	10	1	
124	56	47	7(10)	-	

TEST NO. 088 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	356	154	4,7	1	
132	221	84	4,7,12	1	
113	79	-	4,12	1	
123	99	-	4,7,12	1	
114	25	25	10,3	1	
124	24	20	3,7	1	

LO_2/RP-1 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 100 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	398	216	10,12,7	1	
132	713	-	10,12,7,3	2	
113	285	114	12	1	
123	282	131	10,12,7	1	
114	85	74	12	1	
124	68	70	12,4,7	1	

TEST NO. 301 PROPELLANT WT. 94,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
116	45	310	-	-	
126	-	-	3	3	

Group 4

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 096 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	3	3	
132	246	72	12(4)	1	
113	129	69	1	1	
123	119	61	1	1	
114	59	50	1	1	
134	52	44	9	1	

TEST NO. 144 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,897	-	10(12,9)	1	
132	233	-	10(1)	2	
113	-	-	3	-	
123	216	111	1(12)	1	
114	49	50	1	1	
124	49	54	1	2	

TEST NO. 202 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	3	3	6
113	-	-	7,3	3	6
123	-	-	12,3	3	6
114	56	74	10(12)	1	
124	58	157	1(2)	1	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 248 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	717	197	1(12)	2	
113	75	36	5	2	
123	194	-	2(10)	1	
114	55	51	1	1	
124	-	43	9	1	

TEST NO. 097 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	602	10(12)	2	
132	-	330	10(4)	2	
113	100	70	1	1	
123	-	-	4(2)	1	
114	-	73	4(2)	2	
124	-	67	1(12)	1	

TEST NO. 208 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	340	-	12(7)	3	
113	-	-	-	-	10
123	-	-	-	-	9
114	-	-	4	2,3	10
124	90	66	12(11)	1	3

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 232 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	2,102	-	12(3)	1	
113	146	-	2(3)	1	
123	-	-	-	-	9
104	-	88	3	1	
114	33	32	5	1	
124	97	20	12(2)	2	

TEST NO. 249 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	675	-	12	3	6
113	-	-	2(3)	2	
123	-	-	7(2)	2	
104	97	93	10(2)	2	
114	238	97	12	1	
124	-	88	10(4)	1	

TEST NO. 250 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	426	393	5(4)	2	
113	397	145	1(2)	1	
123	-	-	7,3	1	
104	86	98	12(5)	2	
114	159	70	1	1	
124	156	81	1	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 218 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	763	-	4(2)	1	
113	106	84	1(10)	1	
123	105	218	1(11)	1	
104	36	23	1	1	
114	63	65	1(10)	1	
124	-	-	3	2	

TEST NO. 219 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	571	133	1	1	
113	-	-	3	1	
123	-	-	3	1	
104	49	98	1	1	
114	100	52	5(2)	1	
124	116	52	1	1	

TEST NO. 220 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	741	990	1	2	16
113	375	-	4(3)	3	6
123	241	363	4	1	
114	434	147	5(12)	1	
124	515	86	7(12)	1(2)	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 267 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	585	-	7	1	
113	84	-	3	3	15
123	69	561	11	1	15
114	188	-	3	1	
124	17	244	3	3	6

TEST NO. 268 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	3	1	
113	195	173	3	3	6
123	220	752	11,4	1	
114	401	-	10,7	3	6
124	337	593	7,3	1	

TEST NO. 284 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	271	-	11,5	1	15
115	76	-	4	1	12
125	64	-	8,4	1	12
116	35	-	5	1	
126	68	-	3,4,7	1	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 285 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	2,884		3	1	
115	1,998	2,560	2,7,12	1	
125	2,034	3,293	2,7,12	1	
116	-	956	2,7,12	1	
126	-	692	2,7,12	1	

TEST NO. 110 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	7,3	1	
132	-	-	7,3	1	
113	157	71	2(12)	2	
123	144	76	1	1	
114	68	61	1	1	
124	76	59	1(12)	2	

TEST NO. 141 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	765	140	12	2	
132	235	56	11(10)	2	
113	77	47	1(11)	1	
123	67	61	10(9)	1	
114	22	20	1(10)	2	
124	-	-	3	1	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 205 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	579	219	10(12)	2	
113	191	121	1(10)	1	
123	127	46	2(4)	1	
114	-	-	3	1	
124	124	-	7	1	

TEST NO. 206 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	155	-	1	2	
113	198	-	9(10)	1	6
123	-	-	3	3	6
114	-	-	10(3)	1	6
124	-	-	3(2)	1	6

TEST NO. 207 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	146	-	3	1	
113	255	-	12(4)	1	
123	-	-	3(2)	1	
114	49	43	1	1	
124	-	-	7(3)	1	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 236 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	389	72	2	2	
113	213	128	11(2)	1	
123	87	105	2(7)	1	
114	74	98	9(2,3)	1	
124	136	74	1(10)	2	

TEST NO. 107 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,801	767	9(10)	1	
132	-	-	-	-	9
113	-	-	3	1	
123	150	69	10	3	
114	43	64	11	1	
124	60	64	1(2)	2	

TEST NO. 142 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	618	200	7(2)	2	
132	528	116	1(12)	1	
113	145	95	1(2)	1	
123	101	67	1(10)	1	
114	49	39	1(2)	1	
124	40	37	1	1	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 190 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	1,048	-	12	3	6
113	523	721	12,3	3	6
123	-	-	3	3	
114	335	756	7,3	1	
124	-	-	7,3	1	

TEST NO. 269A PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	7,3	3	
113	2,022	803	7,1	3	7
123	-	529	4,11	1	
114	305	243	1	1	
124	162	134	1	1	

TEST NO. 098 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	473	255	5	2	
132	320	173	9(7)	2	
113	96	91	10(2)	2	
123	-	-	10	1	
114	36	48	1(2)	1	
124	41	45	1(12)	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 154 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	585	208	6(5)	1	
132	513	114	1(12)	2	
113	-	-	10(12)	1	
123	-	-	10(12)	1	
114	49	40	1	2	
124	38	40	1(10)	2	

TEST NO. 099 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	3	1	
132	-	-	3	1	
113	179	80	1	2	
123	162	67	12	2	
114	53	64	1	1	
134	52	72	4(12)	2	

TEST NO. 109 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	348	132	1	2	
132	285	97	1	1	
113	76	46	1(11)	1	
123	58	62	5(2)	1	
114	40	36	1(10)	2	
124	46	41	9	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 108 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	10,7	3	7
132	1,087	-	10(12)	3	7
113	124	31	10(3)	1	
123	125	63	10(2)	2	
114	60	73	10(2)	2	
124	63	76	1(12)	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 121 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	1,173	-	10,12,4	1	
113	251	-	4,7,3	1	
123	-	-	-	-	9
114	77	-	8,7,3	1	
124	83	-	12	1	

TEST NO. 122 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	10,7	1	
113	262	92	1(12)	1	
123	-	-	-	-	9
114	62	62	2	1	
124	59	66	1	2	

TEST NO. 123 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	368	79	4(2)	2	
113	-	203	10(3)	1	
123	-	-	-	-	9
114	80	72	6(7)	2	
124	-	41	2	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 176 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	854	-	10(12)	2	
132	915	-	2(5)	2	
113	309	254	7(2)	1	
123	-	-	4	1	10
114	131	123	7(5)	2	
124	113	131	8(4)	2	

TEST NO. 177 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	575	300	4	2	
132	355	299	4(3)	1	
113	231	-	10(12)	1	
123	244	-	4	2	
114	-	68	10(12)	2	
124	67	70	1	2	

TEST NO. 155 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,055	642	4(10)	1	
132	-	-	5(12)	2	
113	-	-	3	1	
123	494	-	10(12)	1	
114	140	103	10(7)	2	
124	113	93	2	2	

LO_2/RP-1 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 156 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	4(9,10)	1	
132	1,182	53	10(12)	2	
113	-	-	4(9,10)	1	
123	-	-	7(10)	1	
114	160	50	7	2	
124	157	49	1(10)	2	

TEST NO. 124 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	259	28	2	1	
132	305	55	12	2	
113	54	-	11(2)	1	
123	-	-	3	1	
114	28	26	11	1	
124	23	23	11	1	

TEST NO. 125 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	7,3	3	
132	847	-	7(2)	1	
113	-	138	4	2	
123	384	-	10(11)	1	
114	-	-	2	2	
124	124	124	10	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 127 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	10,7	3	7
132	-	-	10,3	2	
113	302	100	1(12)	2	
123	-	-	10,3	1	
114	65	88	1	2	
124	75	95	1(12)	2	

TEST NO. 140 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	718	225	7(3)	3	
132	264	37	12(3)	2	
113	117	56	12(4)	2	
123	93	72	1	1	
114	45	37	1	2	
124	44	44	1	2	

TEST NO. 179 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	3	1	
132	721	91	12(4)	2	
113	196	88	1(2)	1	
123	-	-	4	1	
114	42	39	1	1	
124	41	42	1	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 050 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	1	1	
113	-	-	1	1	
123	365	248	2	1	
114	-	-	12(2)	1	
124	105	156	4(3)	1	

TEST NO. 051 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	-	-	9
113	130	112	12	1	
123	120	146	10(2)	1	
114	45	81	12(5)	1	
124	38	84	12(5)	1	

TEST NO. 093 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	635	364	4(9)	1	
132	573	173	12	1	
113	222	184	2	2	
123	221	194	2	2	
114	75	122	5	2	
124	-	-	3	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 053 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	-	2	9
113	-	-	-	2	9
123	-	-	7(2)	2	5
114	-	-	11(2)	2	
124	-	-	11(4)	2	

TEST NO. 090 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	929	294	12(2)	1	
132	359	132	1(2)	1	
113	149	139	1(12)	2	
123	153	183	1	1	
114	47	98	1	1	
134	42	76	1(4)	2	

TEST NO. 091 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	503	264	1(11)	1	
132	217	88	1(2)	1	
113	67	77	1	1	
123	63	77	1	1	
114	43	60	1(11)	1	
124	21	44	1(11)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 118 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	372	114	4	1	
132	241	71	4	1	
113	110	73	1	1	
123	-	-	9(2)	2	10
114	31	66	1	1	
124	30	66	1(5)	1	

TEST NO. 199 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	-	-	3	2	
113	92	48	12	2	
123	102	39	1(11)	2	
104	14	-	4(2)	3	
114	-	-	11,3	2,3	6
124	23	26	4(10)	2	

TEST NO. 200 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	279	-	10	3	
113	98	72	1	1	
123	87	35	1	3	
104	16	48	1(2)	2	
114	-	-	10,11,8	2	
124	19	72	4(11)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 167 PROPELLANT WT. 133 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	973	241	12	1	
132	553	229	12	1	
113	171	155	4(7)	2	
123	127	126	1	2	
114	62	72	1(2)	2	
124	47	71	4(1)	2	

TEST NO. 172 PROPELLANT WT. 133 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	755	-	2(4)	3	
132	474	-	1(12)	3	
113	-	-	-	-	9
123	191	162	10(1)	1	
114	72	91	4(2)	1	
124	116	79	12(6)	2	

TEST NO. 210 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	249	141	4(2)	1	
113	-	-	11	2	10
123	-	-	-	2	9
104	-	-	-	-	9
114	47	148	12	2	
124	35	28	11	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 212 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	371	125	4	1	
113	-	-	-	-	9
123	158	55	1	1	
114	38	-	11(2)	2	
124	36	17	1(4)	2	

TEST NO. 213 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	-	-	10(2)	3	
113	353	411	4(2)	2,3	
123	637	189	11(2)	2	
104	-	-	3	2	
114	-	-	6(2)	2	
124	194	188	1	2	

TEST NO. 265 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	791	86	4	1	
113	-	175	4(9)	1	
123	145	373	11	2	
104	31	37	11(1)	1	
114	55	135	1	1	
124	58	66	11(1)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 277 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
116	8	27	1	1	15
126	5	24	1	1	15

TEST NO. 279 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	-	-	-	-	15
115	-	-	-	-	15
125	-	-	-	-	15
116	-	-	-	-	15
126	-	-	-	-	15

TEST NO. 281 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	-	-	-	-	15
115	-	-	-	-	15
125	-	-	-	-	15
116	-	-	-	-	15
126	-	-	-	-	15

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 052 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	-	-	9
113	-	-	4	1	
123	-	-	-	-	9
114	23	30	1	1	
124	17	23	1(2)	1	

TEST NO. 057 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	-	-	11	1	15
113	-	-	11	1	15
123	-	-	10(7)	2	
114	-	-	11	2	
124	-	-	7(10)	2	5
134	9	11	1	1	

TEST NO. 092 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	179/137	57/95	11,12/11,4	1	17
113	81/	48/	1/3	2	
123	58/	52/	1/3	2	
114	26/23	38/94	11,12/11,4	1(2)	17
124	22/13	3/69	11,12/12	1	17

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 054 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	-	-	12(11)	1	
113	-	-	5(11)	1	
123	-	-	-	-	9
114	-	-	11(1)	1	
124	13	27	11	1	
134	30	36	8	1	

TEST NO. 055 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	-	-	9	1	15
113	-	-	11	1	15
123	-	-	8	1	15
114	-	-	11,8	2	
124	7	10	9(11)	1	
134	6	11	9	1	

TEST NO. 094 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	829	207	1	2	
132	629	176	4(2)	2	
113	180	148	1(2)	2	
123	171	133	6(2)	2	
114	63	78	2(5)	2	
124	89	79	12(2)	2	

LO_2/LH_2 CONFINEMENT-BY-THE-MISSILE TESTS

TEST NO. 138 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	332	112	4	2	
132	-	-	3	2	
113	55	49	12(1)	1	
123	56	89	1	1	
114	35	50	1	1	
124	35	48	1	2	

Group 8

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 105 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	210	116	1	2	
132	139	44	1(10)	1	
113	92	58	1(11)	1	
123	61	62	5(11)	1	
124	26	27	1	1	
134	35	37	1	1	

TEST NO. 152 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	7	3	
132	-	-	7	3	
113	-	-	10,11,3	1	
123	249	143	10,7	1	
114	27	40	12,4	2	
124	55	52	12	2	

TEST NO. 153 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	351	-	7	1	8
132	356	-	7	1	8
113	272	-	12	2	8
123	163	-	10(11)	2	8
114	51	-	1(2)	2	8
124	59	-	10(2)	2	8

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 184 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,021	-	10(12)	1	
132	609	212	4,7	2	
113	171	95	1(12)	2	
123	-	109	11(10)	1	
114	-	-	5,4,3	3	
124	46	-	1(11)	1	

TEST NO. 201 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	389	-	4(12)	3	
113	-	-	7,3	3	
123	-	-	3	1	
114	-	-	10,6,3	1	
124	121	-	7,3	3	

TEST NO. 225 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	1(7)	1	
113	224	156	1	1	
123	-	-	10,11	3	
114	41	83	4(2)	1	
124	-	80	8	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 197 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	3	2	
113	341	-	12(3)	1	
123	138	110	10,4	1	
114	-	-	3	1	
124	-	-	3	2	

TEST NO. 203 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	-	-	9
113	148	186	10	3	
123	204	-	11(1)	1	
114	40	-	10(4)	2	
124	66	77	11(2)	1	

TEST NO. 204 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	1,823	657	12(4)	1	
113	486	231	12(10)	1	
123	323	-	3(12)	3	
114	83	-	10(2)	3	
124	96	136	5(1)	2	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 229 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	570	224	4(5)	1	
113	61	85	5	1	
123	-	-	3	1	
114	31	51	1	2	
124	52	78	6(5,2)	2	

TEST NO. 230 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	407	84	1	2	
113	226	87	1	1	
123	148	143	1	1	
114	67	51	1	1	
124	57	43	1(11)	1	

TEST NO. 231 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	419	185	4(12)	1	
113	-	129	8	1	
123	302	-	11(10,2)	3	
114	50	44	1	1	
124	69	57	1	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 251 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	391	2(4)	2	
113	-	-	-	3	
123	-	-	10,3	3	
114	421	183	12(4)	1	
124	178	-	1(4)	3	

TEST NO. 252 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	377	181	4(5)	2	
113	-	74	10,3	3	
123	-	-	10,3	3	
114	44	57	1	1	
124	170	69	12(2)	1	

TEST NO. 254 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	110	10(11)	2	
113	-	159	4,5	2	
123	345	214	5(4)	1	
114	80	65	4(5)	3	
124	47	61	4(11,5)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 211 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	563	282	1	1	
113	253	108	1	1	
123	141	71	10(11)	1	
114	86	76	1	1	
124	101	139	10(11)	1	

TEST NO. 217 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	-	-	7,3	3	
113	254	257	5(4)	1	
123	-	-	3,7	3	
114	-	-	3	1	
124	376	229	4(12)	1	

TEST NO. 262 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	2,076	608	7,3	1	
113	476	228	10(11)	1	
123	880	398	4(5)	1	
114	-	371	8,10,11	1	
124	808	1,087	4(5)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 264 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	1,112	335	12,3	1	
113	281	155	5,4	1	
123	345	178	12,5,4	1	
114	177	-	4	3	
124	284	328	4,5,3	1	

TEST NO. 266 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	1,113	254	1	1	
113	248	111	1(5)	1	
123	252	150	5(11)	1	
114	88	133	1(11)	1	
124	379	261	1	1	

TEST NO. 288C PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	-	-	10,4	1	
115	206	718	7,5	1	
125	269	-	7,4	1	
116	139	-	4,2	1	
126	150	363	4,2	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 289 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	208	2,002	12,8	3	
115	74/97	493	4,3	1	1
125	115	-	12,3	3	6
116	-	-	-	-	9
126	97	303	4,10	1	

TEST NO. 290 PROPELLANT WT. 25,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
114	385	284	12,8	3	
115	185	430	10,12,7	3	1
125	151	-	3	3	
116	-	-	3	1	9
126	96	262	3	1	

TEST NO. 114 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	2,034	894	10(9)	2	
132	1,238	84	10(12)	1	
113	181	122	1	2	
123	208	116	10(8)	1	
114	84	113	1(2)	1	
124	88	84	1	2	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 150 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	10	3	
132	-	-	10	3	
113	205	-	1(2)	3	
123	156	134	10	1	
114	90	86	1	2	
124	65	86	1	2	

TEST NO. 151 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	944	500	2(10)	1	
132	778	-	1(12)	3	
113	322	-	7(10)	2	
123	318	233	1(12)	2	
114	100	99	10(2)	2	
124	-	-	9(2)	2	

TEST NO. 195 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	399	384	2(4)	1	
113	362	135	3(2)	1	
123	361	132	12(4)	1	
114	-	-	7(2)	2	
124	-	-	12,8,3	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 226 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	445	203	1(12)	1	
113	147	102	1	2	
123	136	61	11(2)	1	
114	-	43	9	1	
124	154	58	1	1	

TEST NO. 215 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	786	508	4(2)	1	
113	-	-	1	1	10
123	189	-	1(3)	3	
114	180	676	9(10.4)	1	
124	112	94	1(6)	1	

TEST NO. 216 PROPELLANT WT. 1,000 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	694	382	1(12)	2	
113	220	92	4(10)	1	12
123	120	40	4	1	12
114	137	317	10(11)	1	12
124	78	50	1	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 104 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	203	68	10,11	2	
132	110	44	10,11	1	
113	-	-	10,4,8	1	
123	-	-	10,4,8	1	15
114	32	34	1,9	2	
124	-	17	4,3	1	

TEST NO. 164 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	7	1	15
132	198	35	4,7,11	1	
113	83	23	4,11	1	
123	42	37	11,5	1	
114	20	27	11,4	1	
124	12	31	11,5	1	

TEST NO. 165 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	523	209	12,7,11	1	
132	599	182	12,7	1	
113	115	53	4,7	1	
123	48	55	4,5	1	
114	37	34	1,2	1	
124	23	33	4,2	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 103A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	544	241	1(12)	2	
132	-	-	8,4,3	1	
113	111	185	1(2)	1	
123	92	203	1	1	
114	53	85	1	2	
124	65	100	1(2)	2	

TEST NO. 116 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,058	213	12	1	
132	-	-	12	1	
113	118	56	1(11)	1	
123	79	60	1	1	
124	42	34	1	2	
134	41	36	1	2	

TEST NO. 160 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,258	-	4(1)	1	
132	1,089	-	10(12)	3	
113	243	-	10(2)	2	
123	196	138	10(2)	1	
114	-	81	1	2	
124	84	-	1(2)	2	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE VERTICAL TESTS

TEST NO. 161 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	396	-	1(12)	3	
132	308	87	10(11)	2	
113	108	-	2(1)	2	
123	53	46	1	1	
114	31	30	1	1	
124	23	26	1	1	

TEST NO. 113 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	466	347	10	1	
113	403	313	4(2)	1	
123	497	316	1(12)	2	
114	119	129	1	1	
124	129	144	2(10)	2	
134	99	141	10(2)	2	

TEST NO. 115 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	714	134	1(12)	1	
132	377	68	1(12)	1	
113	88	75	10(2)	2	
123	64	86	1	1	
114	30	58	11(10)	1	
124	32	66	11(10)	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 131 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	417	91	12	1	
113	88	57	10	1	
123	-	-	-	-	9
114	24	32	1(10)	3	
124	-	31	12	3	

TEST NO. 132 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	594	201	1(12)	1	
132	-	-	-	-	9
113	113	61	10	2	
123	-	-	3	1	
114	25	29	10(1)	1	
124	22	30	1	1	

TEST NO. 133A PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	685	226	4(3)	1	
132	318	82	4(12)	1	
113	110	85	1	1	
123	-	77	4	1	
114	28	-	10	2	
124	32	36	1	2	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 185 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	728	98	12	2	
113	130	-	1(10)	1	
123	118	59	1	1	
114	33	31	1	1	
124	-	-	-	-	9

TEST NO. 186 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	1,413	241	12	1	
132	-	-	3	-	
113	118	-	4(2)	1	
123	-	69	9(4)	1	
114	26	33	1	1	
124	33	38	1(10)	1	

TEST NO. 223 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	744	164	4	-	
113	137	68	1	1	
123	63	43	4(8,2)	1	
114	40	32	1	1	
124	40	35	11	1	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 224 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	121	96	11(4)	1	
113	122	157	9	1	
123	-	-	8(7)	1	
114	37	44	1	1	
124	24	23	9	1	

TEST NO. 183 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	845	58	12	-	
132	-	-	-	-	9
113	108	64	1,2	-	
123	119	76	12,2	-	
114	48	46	-	-	
124	47	57	-	-	

TEST NO. 196 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	-	-	9
132	576	-	-	-	
113	-	-	-	-	9
123	222	58	12,3	1	
114	-	-	-	-	9
124	35	44	11,4	-	

LO_2/LH_2 CONFINEMENT-BY-THE-GROUND-SURFACE HORIZONTAL TESTS

TEST NO. 228 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
121	-	-	5,4	-	9
132	693	1[illegible]	[illegible]7	-	
113	254	[illegible]	3 7	-	
123	183	-	1[illegible]	-	
114	79	[illegible]	[illegible],4	-	
124	-	[illegible]	-	-	

TEST NO. 253 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	683	21	12	1	
113	410	-	12	3	6
123	368	15	5,3	3	
104	101	12	10,12	1	
114	[illegible]	[illegible]	1	1	
124		-	12,7,3	3	6

Group 10

LO_2/LH_2 Special Tests

TEST NO. 233 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	362	164	4,12	1	
113	447	169	12	2	
114	55	-	3,2,11	2	
124	72	41	11	1(2)	

TEST NO. 242 PROPELLANT WT. 200 LB

STATION NUMBER	PRESSURE (psi)	IMPULSE (psi-msec)	TRACE CHARACTERISTICS		REMARKS
			SHAPE	BASELINE	
132	592	288	12,4	1	
113	136	-	3	2	
114	165	186	10,7	2	
124	95	173	11,3	1	

Section 2

THERMAL DATA

Section 2
THERMAL DATA

This section consists of a presentation of the basic thermal data that were obtained from the 25,000-lb and Titan I tests. The following data are included:

- Heat flux density computed from measurements of the surface temperature of slabs, and a selected sample of the corresponding slab surface temperatures. (All available flux density data from the 25,000-lb and Titan I tests are included. However, data from Tests 277, 281, and 282 are not presented; substantial winds in an unfavorable direction prevented significant instrument response.)
- Radiant flux density within the fireball. (All useful data are included. However, a limited quantity of reliable data was obtained due primarily to transducer failure and failure of the window purge system. No Titan I data were obtained.)
- Radiant flux density outside the fireball. (All available data from the 25,000-lb and Titan I tests are included.)
- Gas temperature as indicated by the thermocouple probes – Sandia Corporation instruments. (Only a sample selection of data from the 25,000-lb tests is presented.)

Gas temperatures as indicated by the photographic recording pyrometer – a Sandia Corporation instrument – are not included. However, a graphic summary of these data is given in Section 6 of Volume I.

The data are organized as indicated in Table 2-1.

The heat flux density data for stations H and S are presented in pairs, one pair for each station, corresponding to the adjacent slab pairs that existed for these two stations as described in Appendix C of Volume I. Usually, the exposed surface of one of each pair was coated with a black deposit, and their companion slabs were either coated with a "white" deposit or the surface was polished. In order that the degree of similarity under identical instrument conditions could be revealed, both slabs at Station H for Test 284 were coated black. These deposits are identified and their properties discussed in Appendix C of Volume I, and the surface condition and slab material for each measurement

Table 2-1

ORGANIZATION OF THERMAL DATA

FIGURE NUMBER	THROUGH	FIGURE NUMBER	DATA DESCRIPTION
2-1		2-9	Heat flux density and selected slab surface temperatures for 25,000-lb LO_2/RP-1 tests.
2-10		2-28	Heat flux density and selected slab surface temperatures for 25,000-lb LO_2/LH_2 tests.
2-29		2-31	Heat flux density for Titan I test.
2-32		2-33	Radiant flux density within the fireball for 25,000-lb tests.
2-34		2-36	Radiant flux density outside the fireball for 25,000-lb LO_2/RP-1 tests.
2-37		2-39	Radiant flux density outside the fireball for 25,000-lb LO_2/LH_2 tests.
2-40		2-40	Radiant flux density outside the fireball for Titan I test.
2-41		2-43	Temperature of thermocouple probes for 25,000-lb tests.

is indicated on the data figure. Since slight differences in the instruments of a given pair of slabs are inevitable, the associated bias was minimized by frequently transposing the sequence or order of the coating arrangement for a given pair.

For Station P, the slabs at positions 1 through 4 were coated black, while Position 5, the conjugate of Position 3 with respect to gas flow, was coated white.

Stations H and S were always instrumented with a pair of slabs, and Station P (which existed only for Tests 288 through 290 and the Titan I test) always

with five slabs. Any omission of the corresponding heat flux data from this arrangement is due, with one exception, to instrument destruction during the test. The measurement at Position 3 of Station P for the Titan I test is not presented due to an inordinately noisy temperature record.

The heat flux density for a black-coated slab will tend to exceed that for a white-coated or polished slab due to the marked difference in radiation absorbing properties. An exception to this was obtained at Station H for Test 275 (Fig. 2-3), where it can be seen that the flux for the polished slab exceeded that for the black slab by the order of 10 percent for approximately the first second. It is not possible to clearly identify the responsible mechanism for this anomaly since several factors are involved. It does not appear probable that the anomaly is due to differences in the gas temperature adjacent to the two slabs since it is unlikely that such differences would be sustained for a second. The following factor may have contributed to the irregularity: The thermocouple junction for the slab with the deposit was effectively at a slightly greater depth, with the consequence that the temperature transducer of the coated slab would not resolve abrupt temperature changes of the actual surface as completely as in the polished slab case. This factor, however, tends to be offset by others; for instance, on a microscopic scale, the surface roughness (or the total effective surface area) of the coated slab is greater than that of the polished metallic surface, with the consequence that energy could enter the coated slab at a slightly greater rate. (The difference in the surface roughness and thermocouple junction depth prompted the subsequent practice of coating both slabs of a pair with deposits having dissimilar absorption properties by similar surface roughnesses and thicknesses.)

The heat flux density of Station S for Test 284 (Fig. 2-6) is not valid beyond about 3 sec, this time being indicated by a vertical line on the data figure. The support structure for this station failed at some time during the test. No data discrepancies are evident until a simultaneous increase and decrease in the flux for companion slabs commences at the above time, followed soon thereafter by a decrease for both slabs to physically unrealistic negative magnitudes.

For the Titan I test, uncertainties in the flux density that are somewhat larger than ordinary are encountered temporarily for some of the measurements at Station P due to noise in the temperature-time records. Specifically, noisy signals were obtained from zero to 0.4 sec for instrument Position 2, and from 1.2 to 1.4 sec for Positions 2 and 4. This will cause flux density uncertainties throughout these time periods and for a comparatively short time thereafter.

Regarding the measurements of radiant flux density within the fireball, correction factors as specified in Appendix C of Volume I have been applied to the data presented in Figs. 2-32 and 2-33. For Test 284 (Fig. 2-33), the window purge system did not successfully function for the measurement labeled "HTL, quartz", and was only partially successful, i.e., there was an opaque deposit over about one-half of the window, for the measurement labeled "Sandia, quartz."

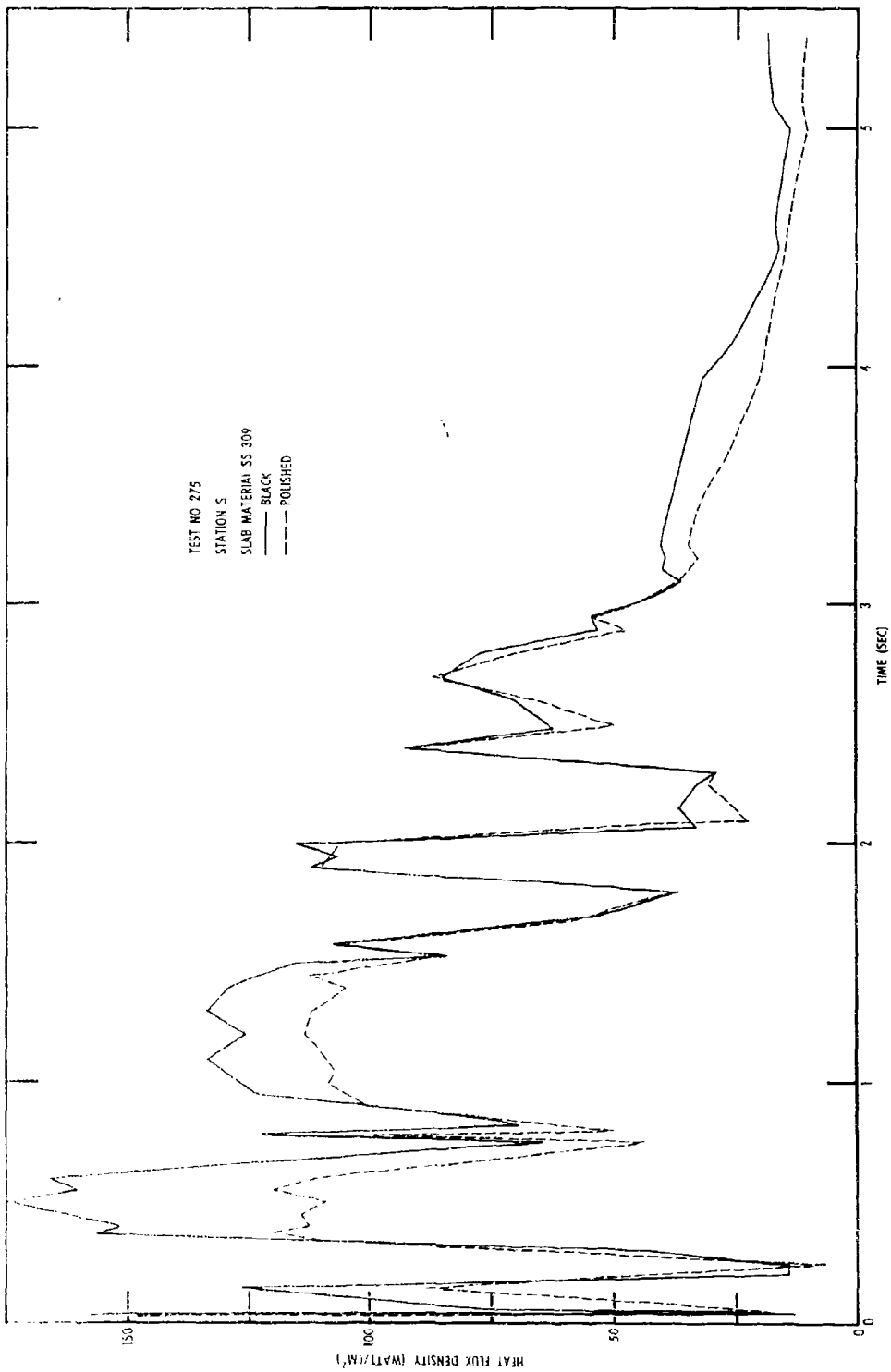


Fig. 2-1. Heat Flux Density at Station S from Test 275

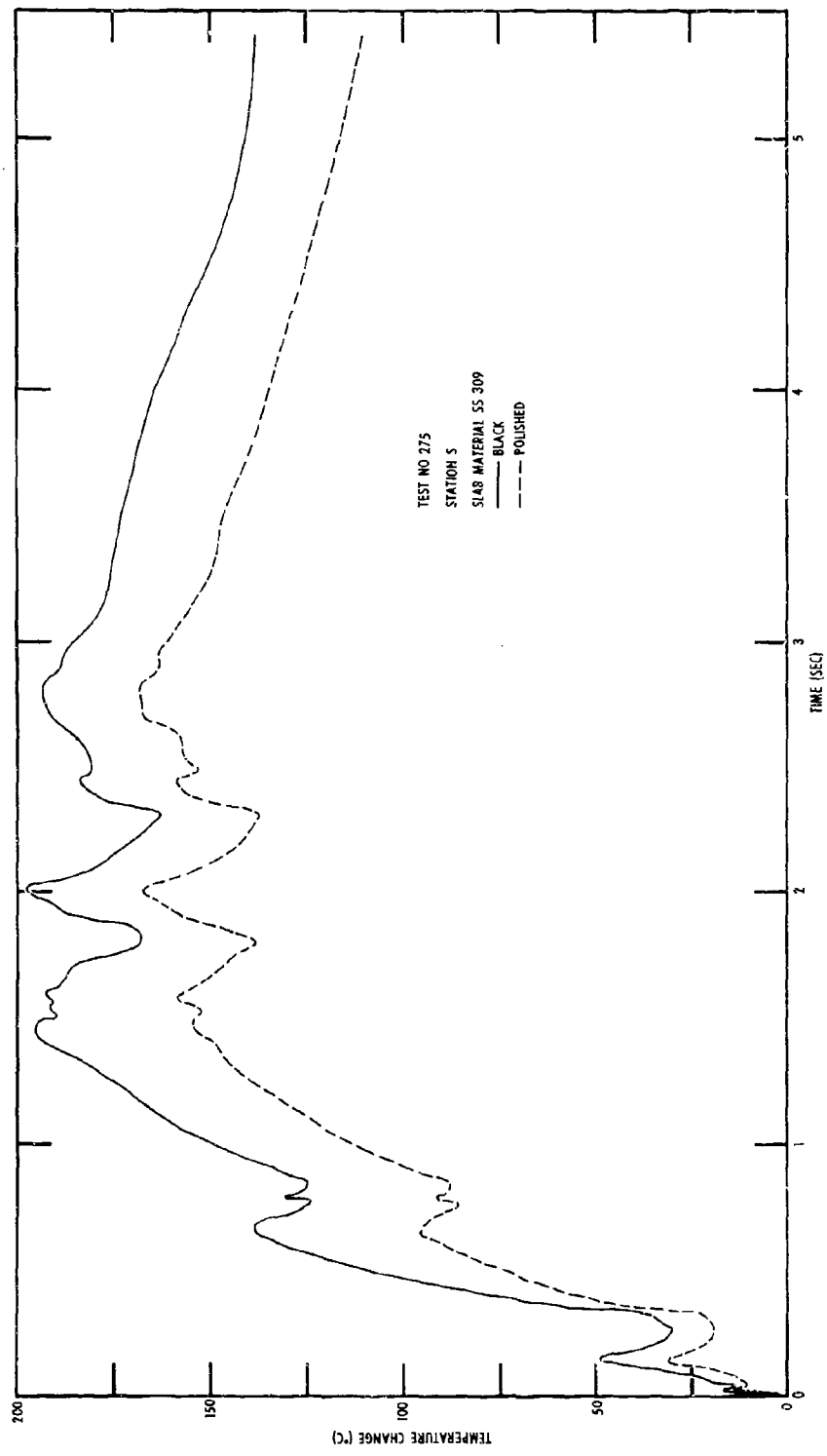


Fig. 2-2. Slab Surface Temperature at Station S from Test 275

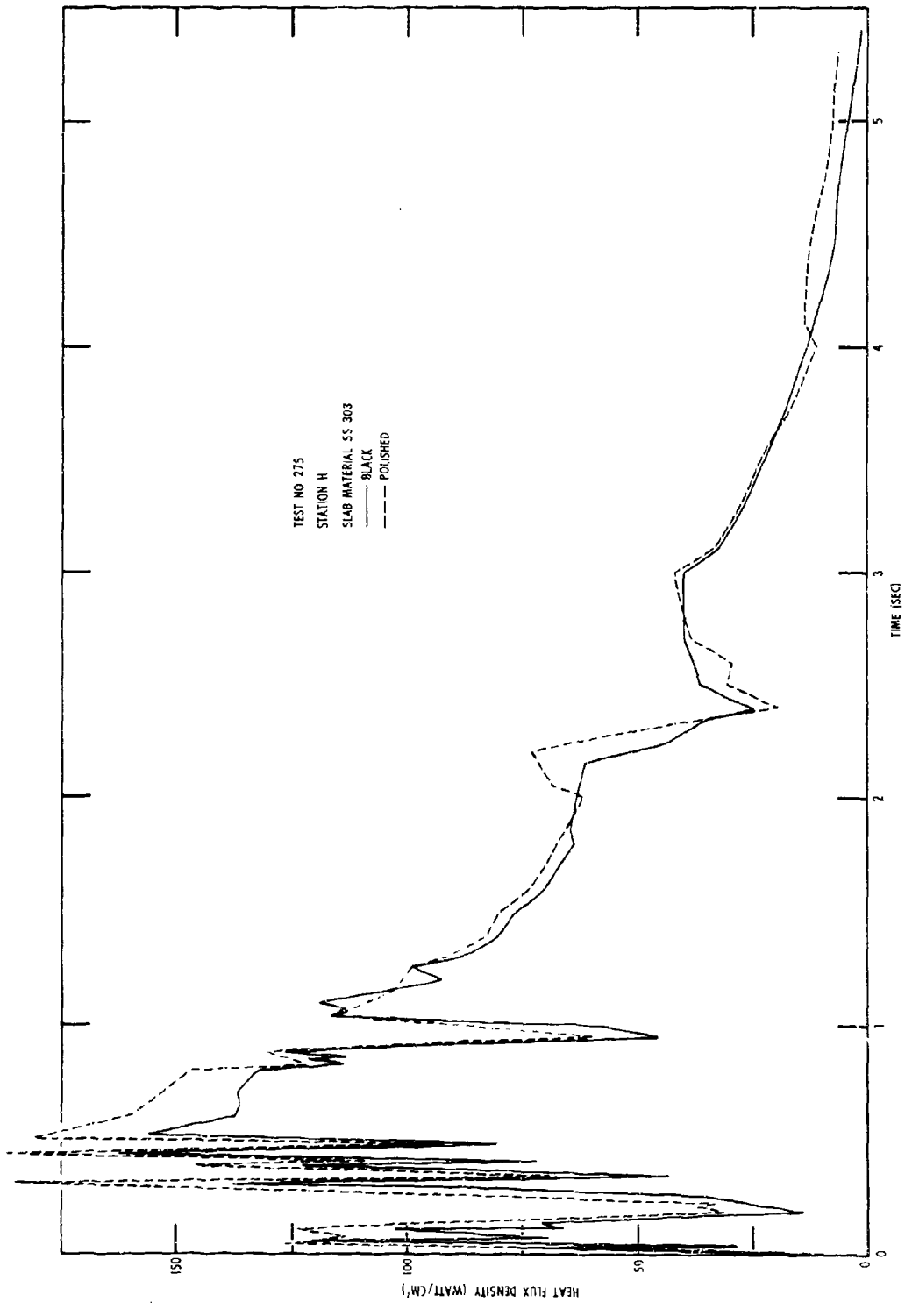


Fig. 2-3. Heat Flux Density at Station H from Test 275

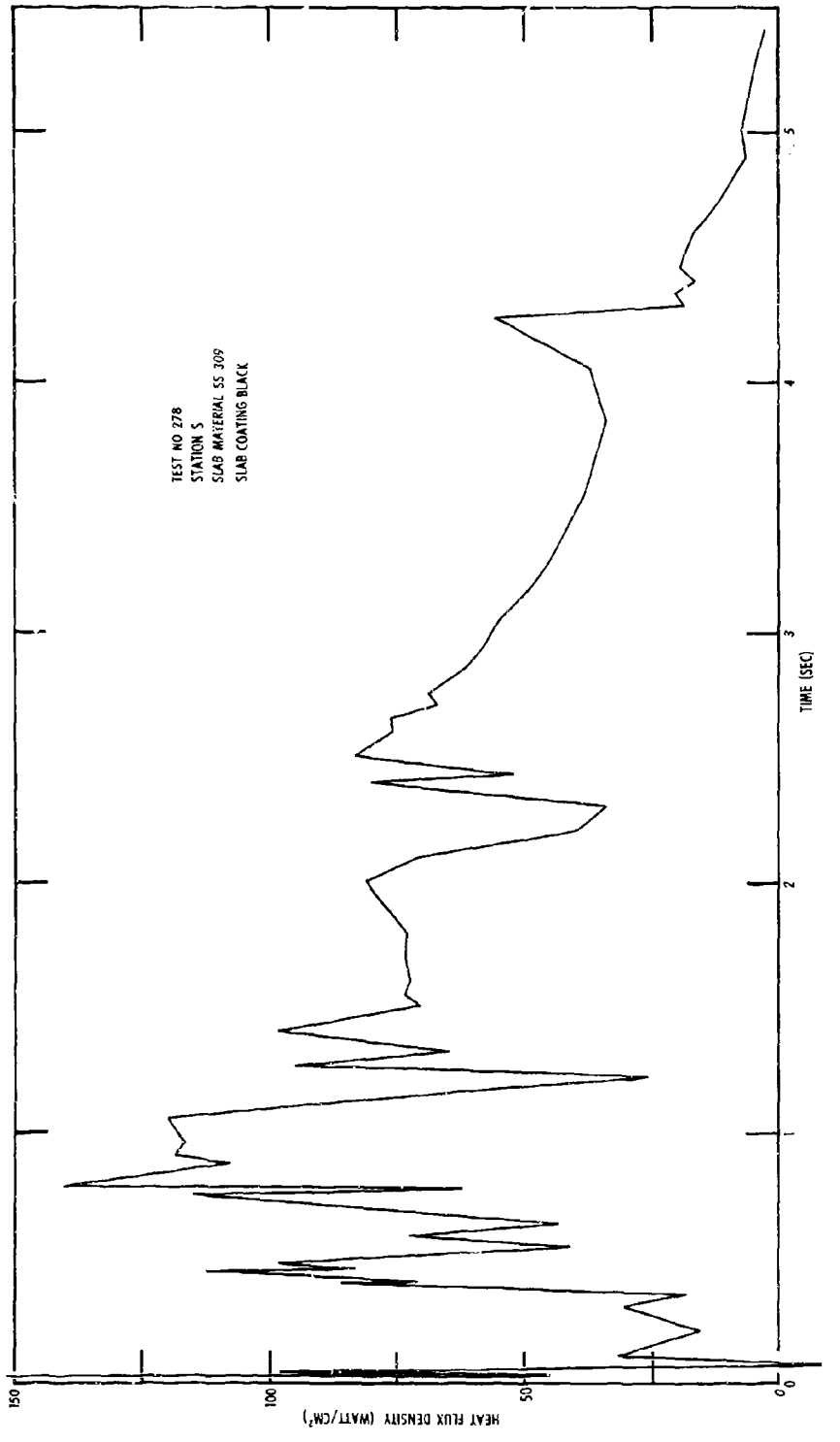


Fig. 2-4. Heat Flux Density at Station S from Test 278

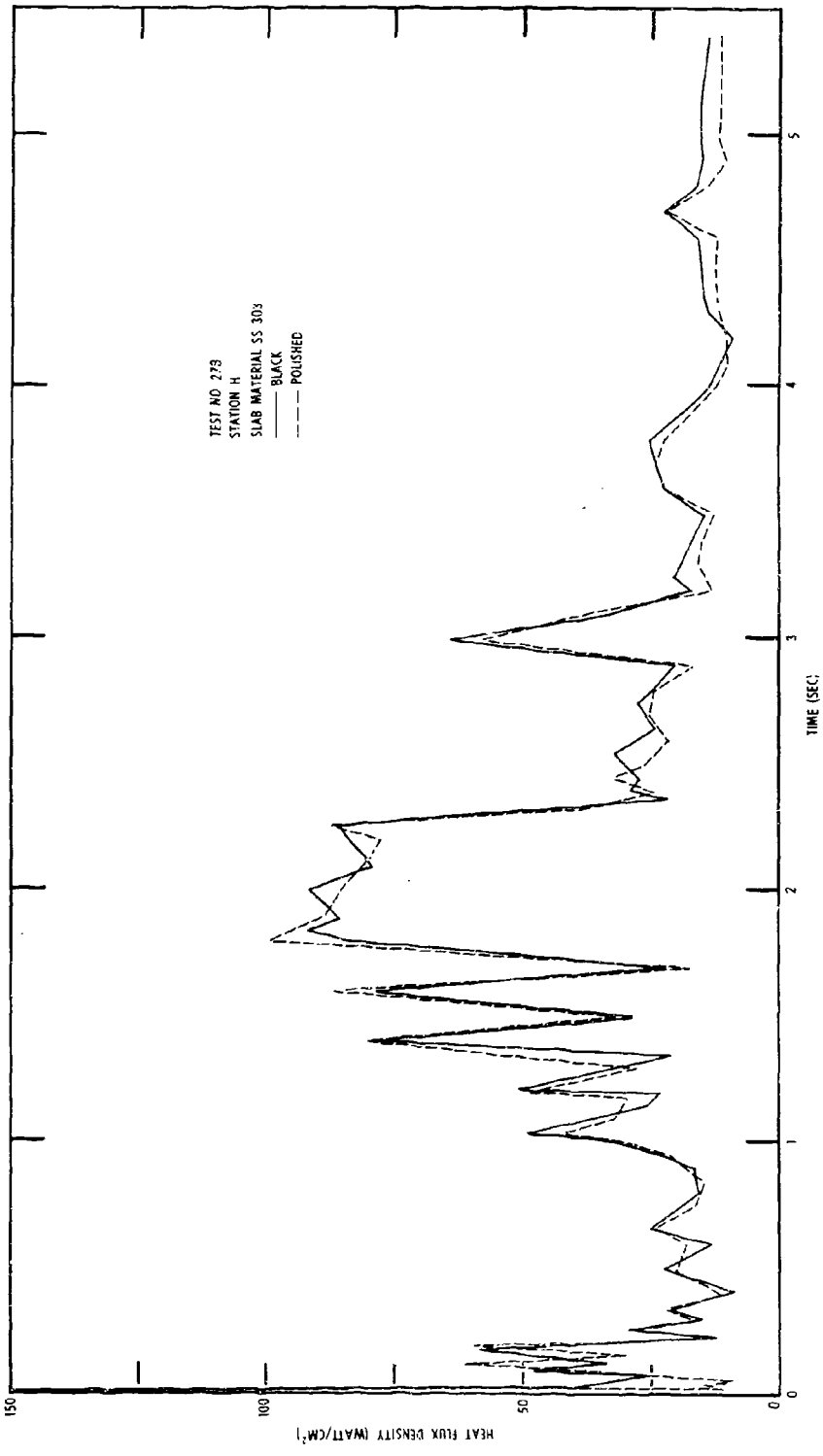


Fig. 2-5. Heat Flux Density at Station H from Test 278

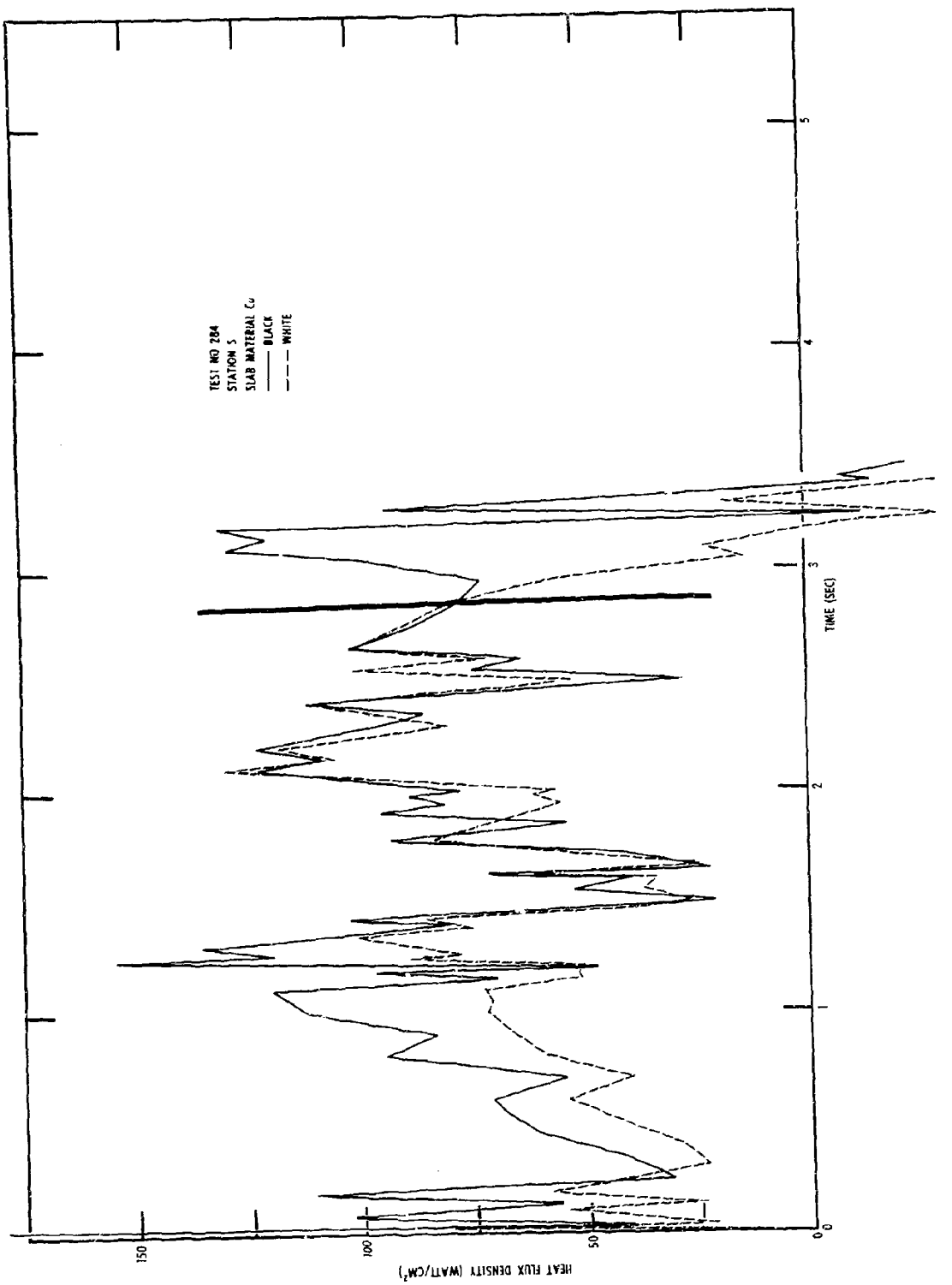


Fig. 2-6. Heat Flux Density at Station S from Test 284

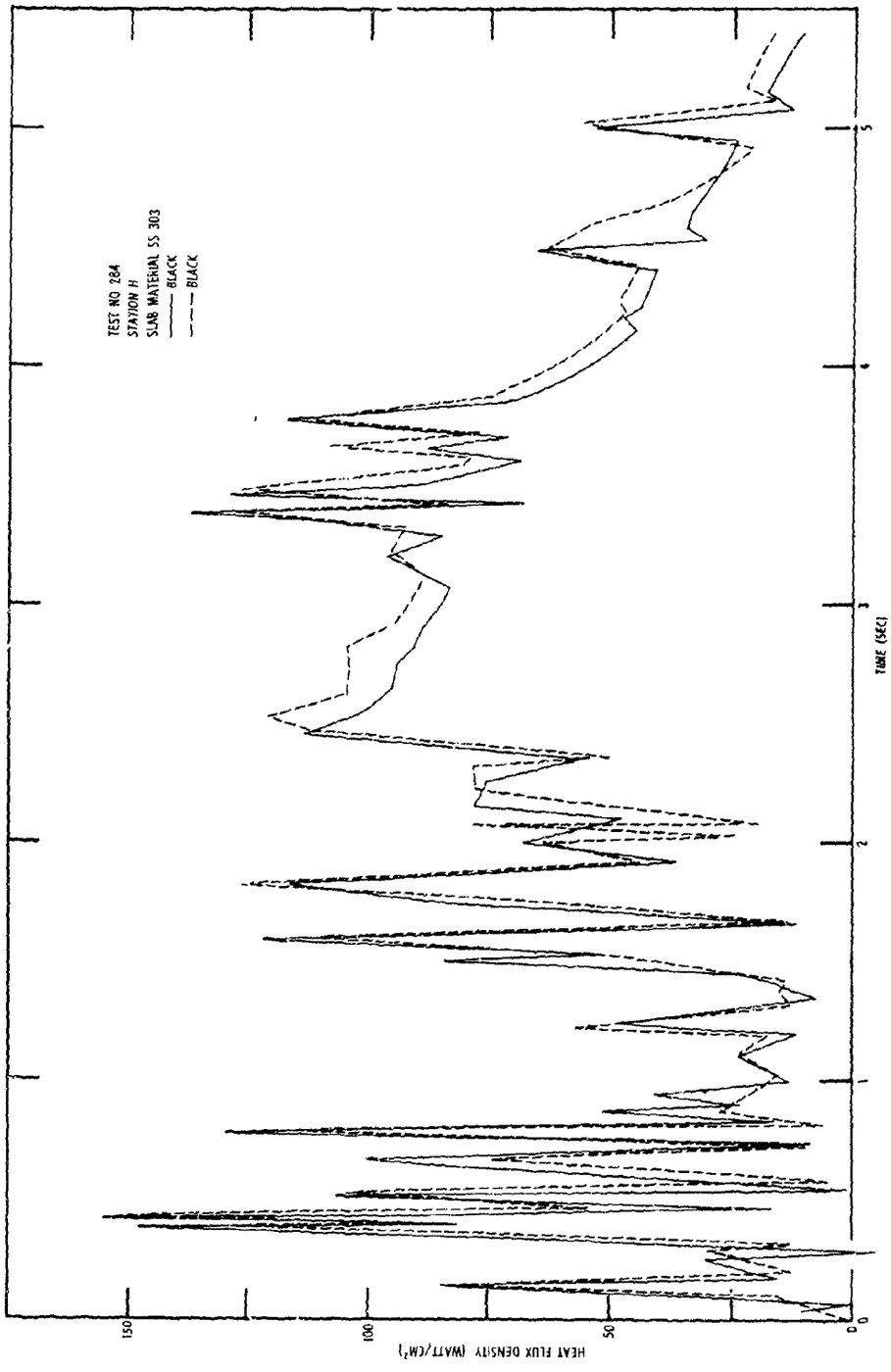


Fig. 2-7. Heat Flux Density at Station H from Test 284

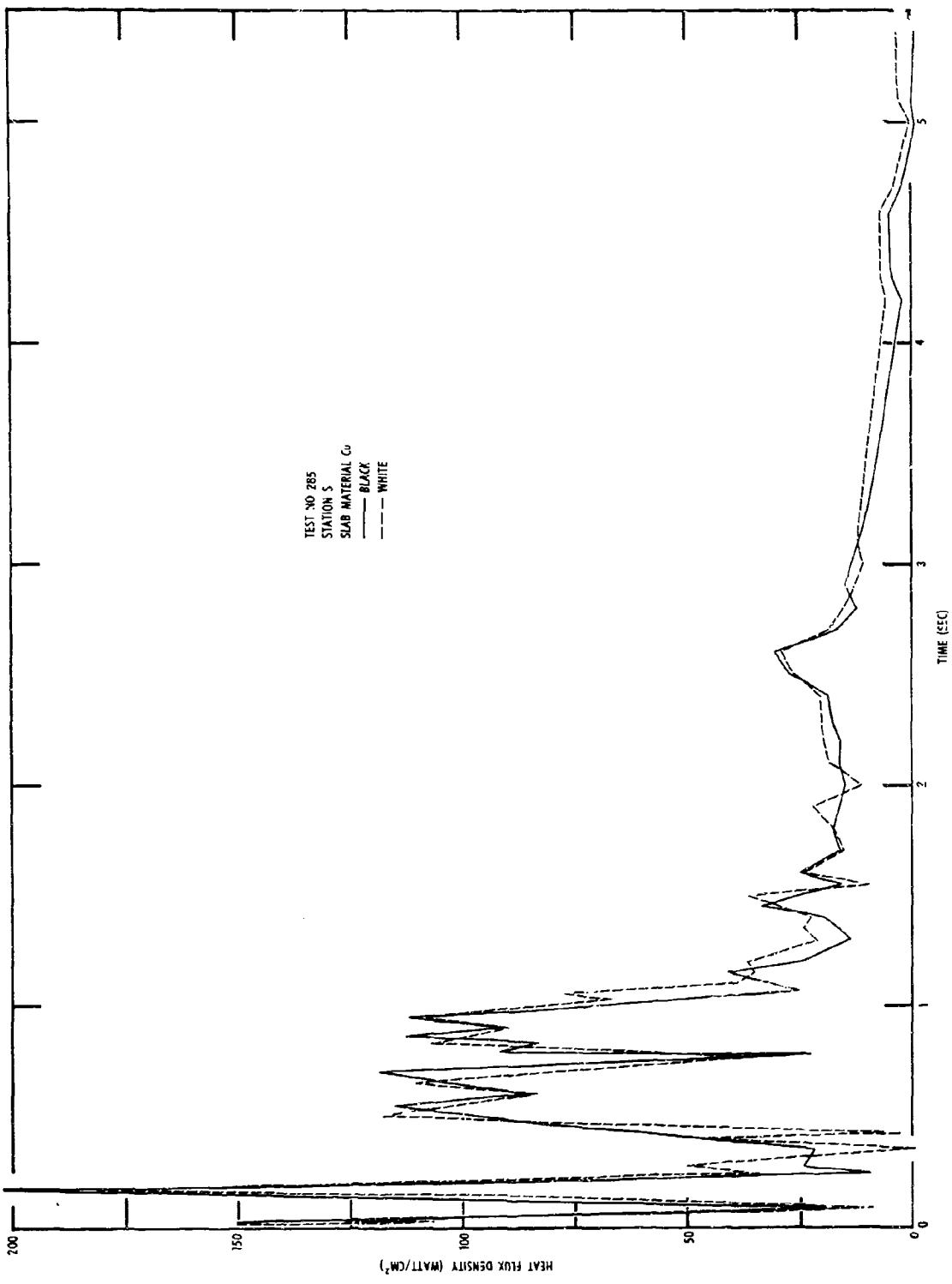


Fig. 2-8. Heat Flux Density at Station S from Test 285

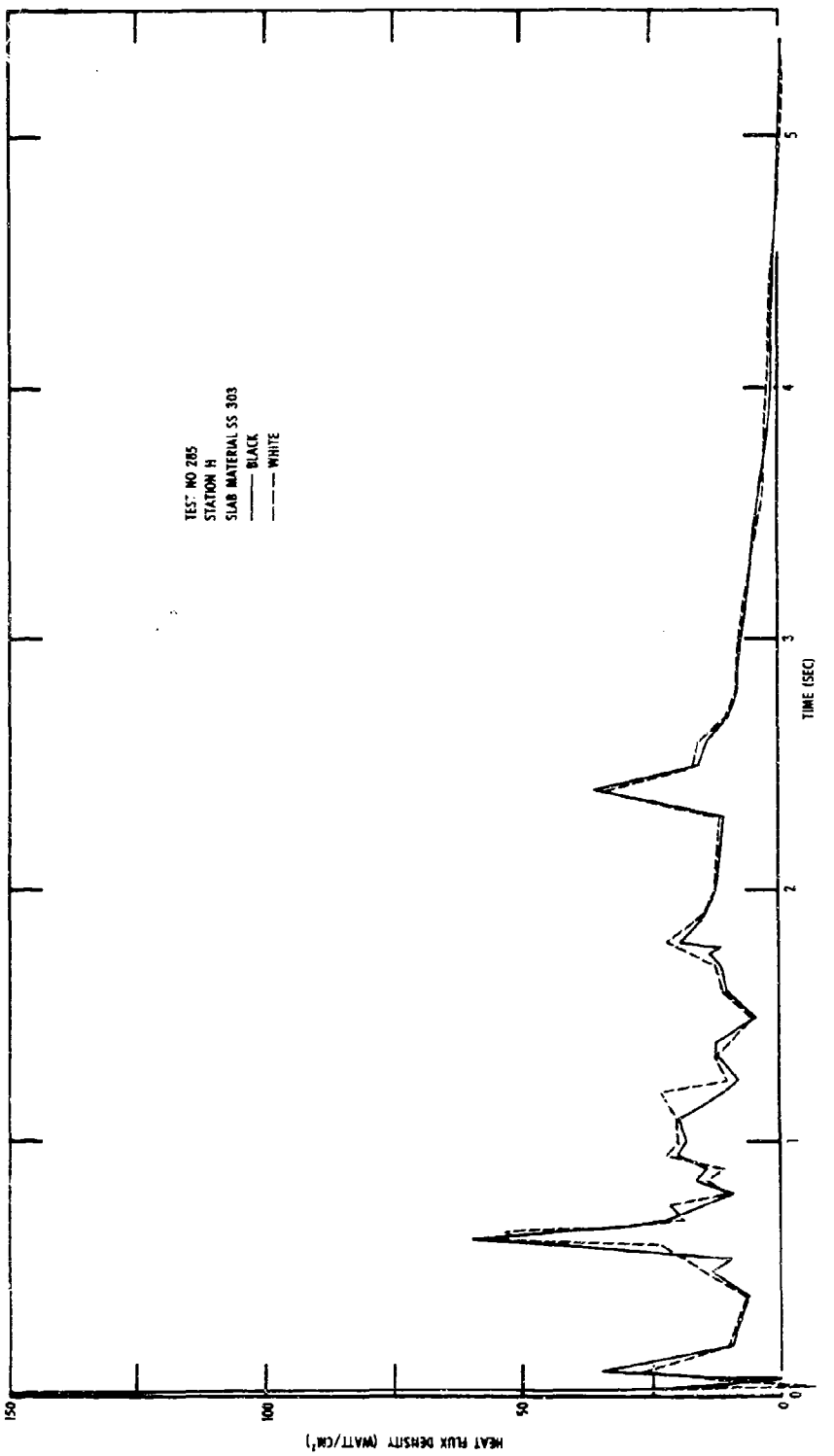


Fig. 2-9. Heat Flux Density at Station H from Test 285

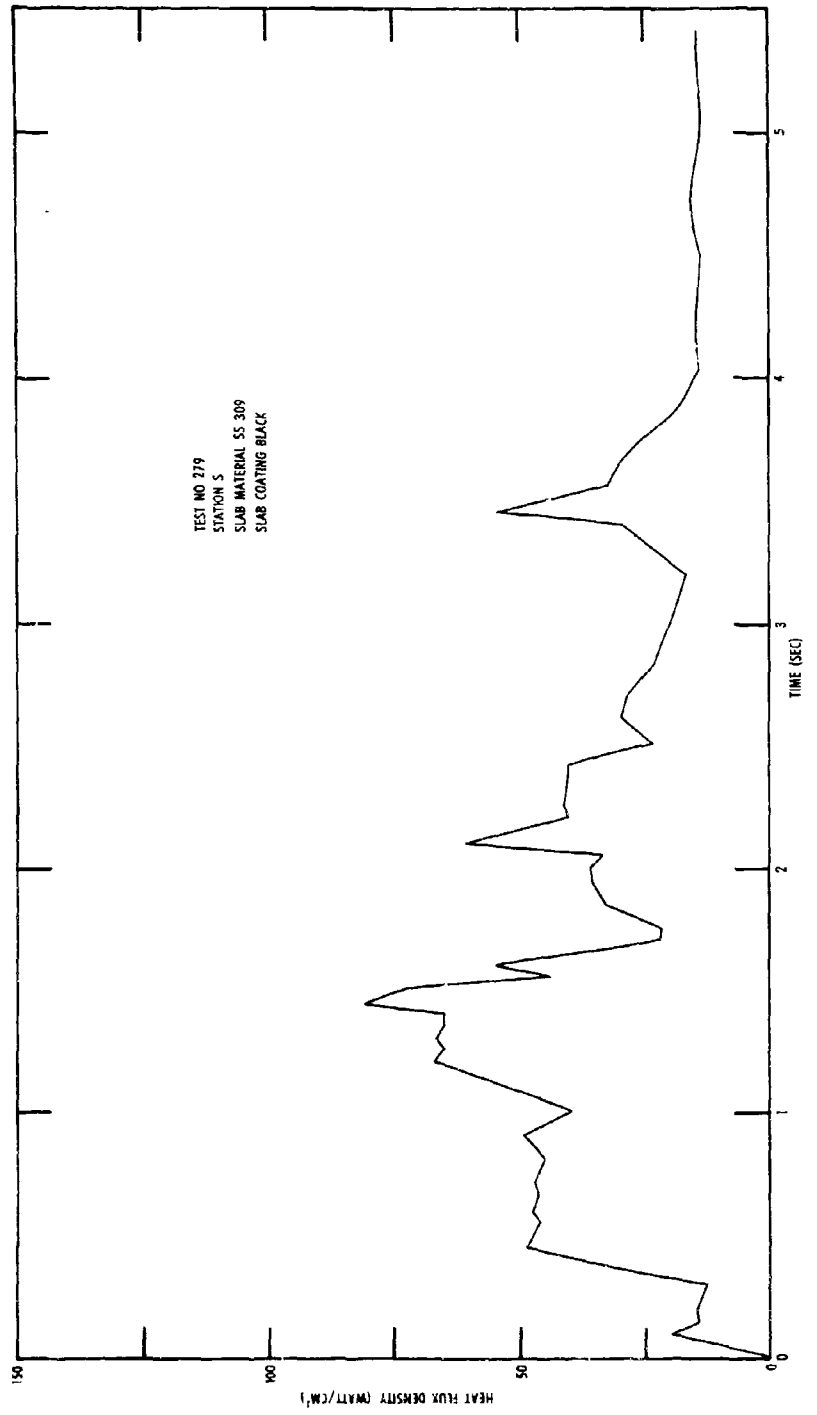


Fig. 2-10. Heat Flux Density at Station S from Test 279

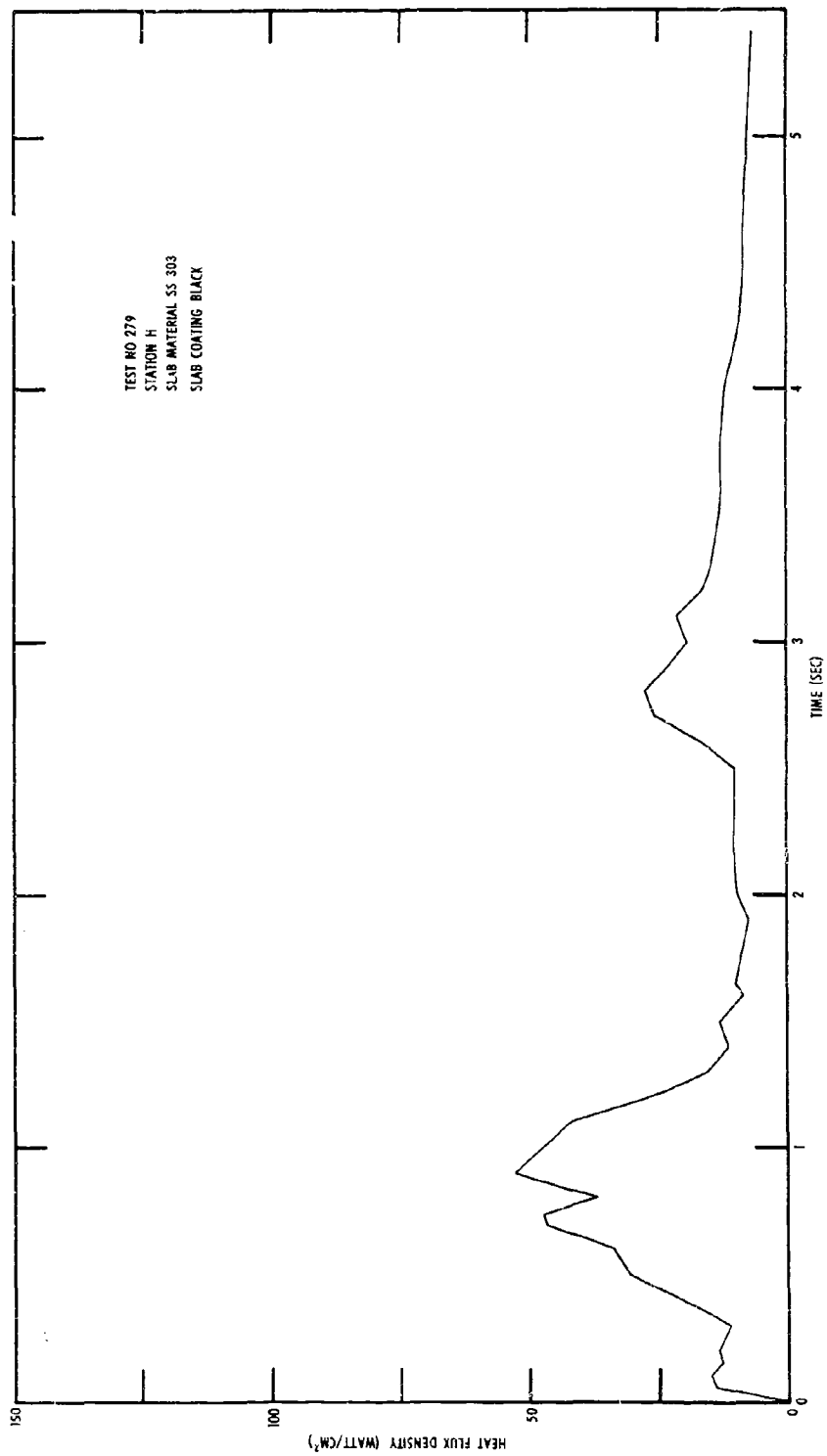


Fig. 2-11. Heat Flux Density at Station H from Test 279

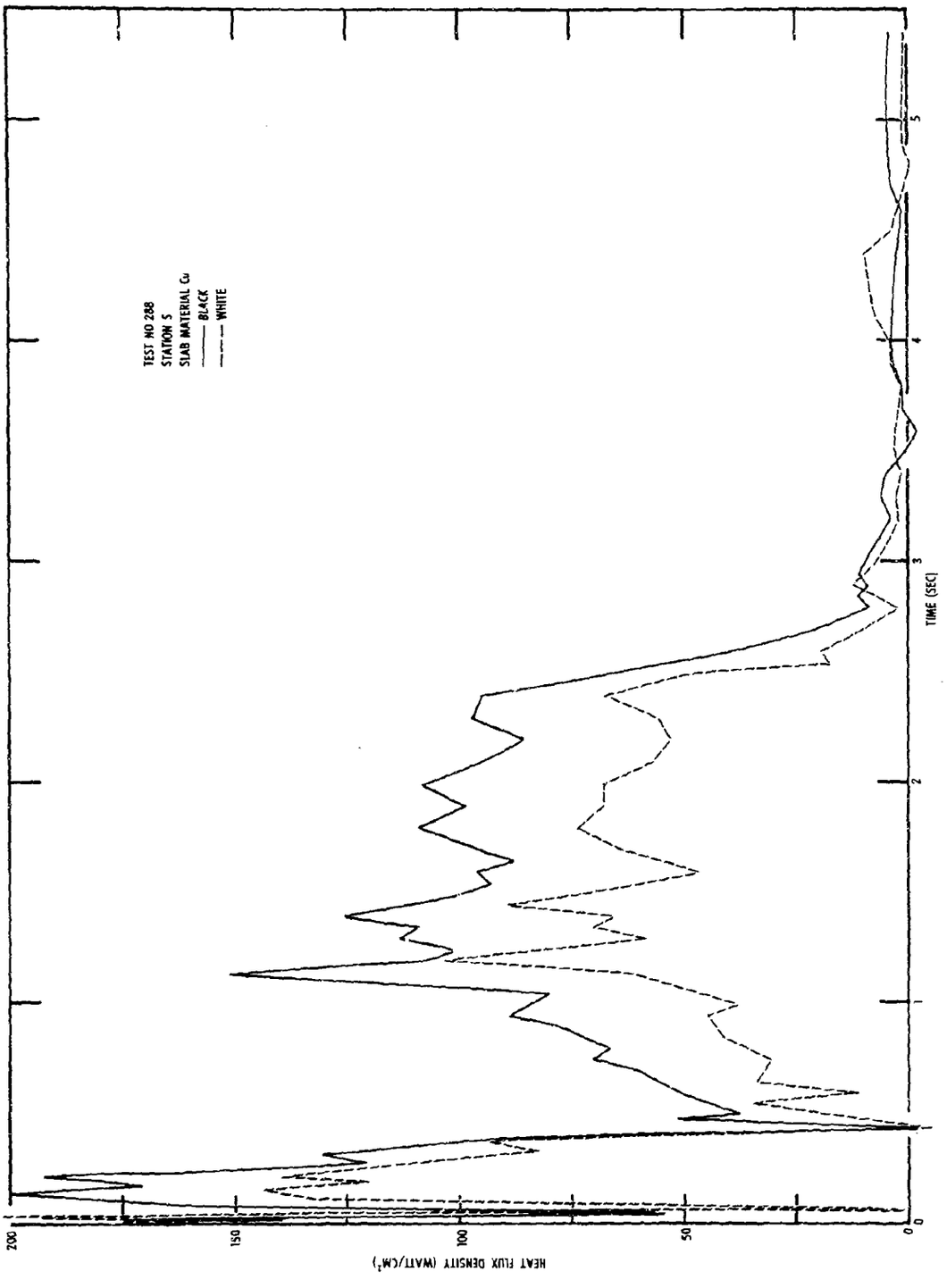


Fig. 2-12. Heat Flux Density at Station S from Test 288

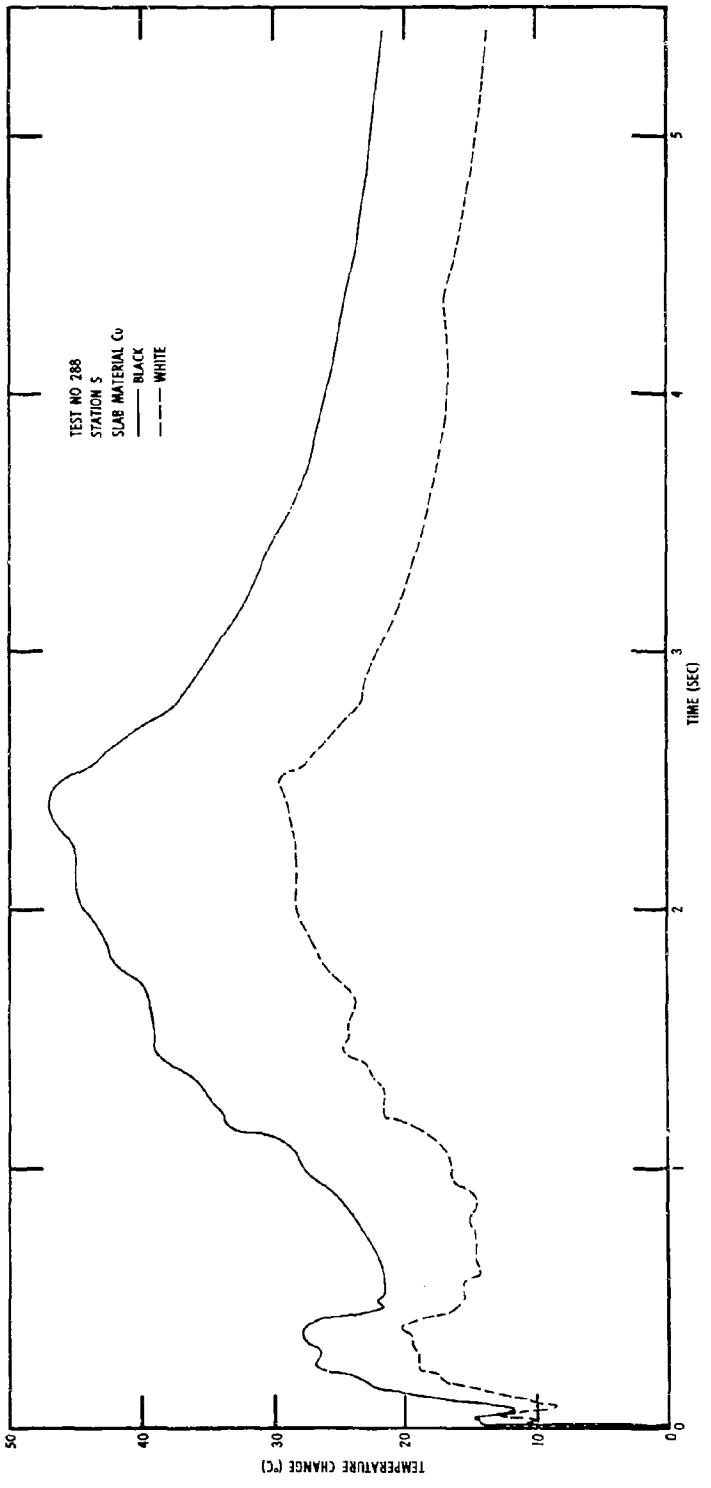


Fig. 2-13. Slab Surface Temperature at Station S from Test 288

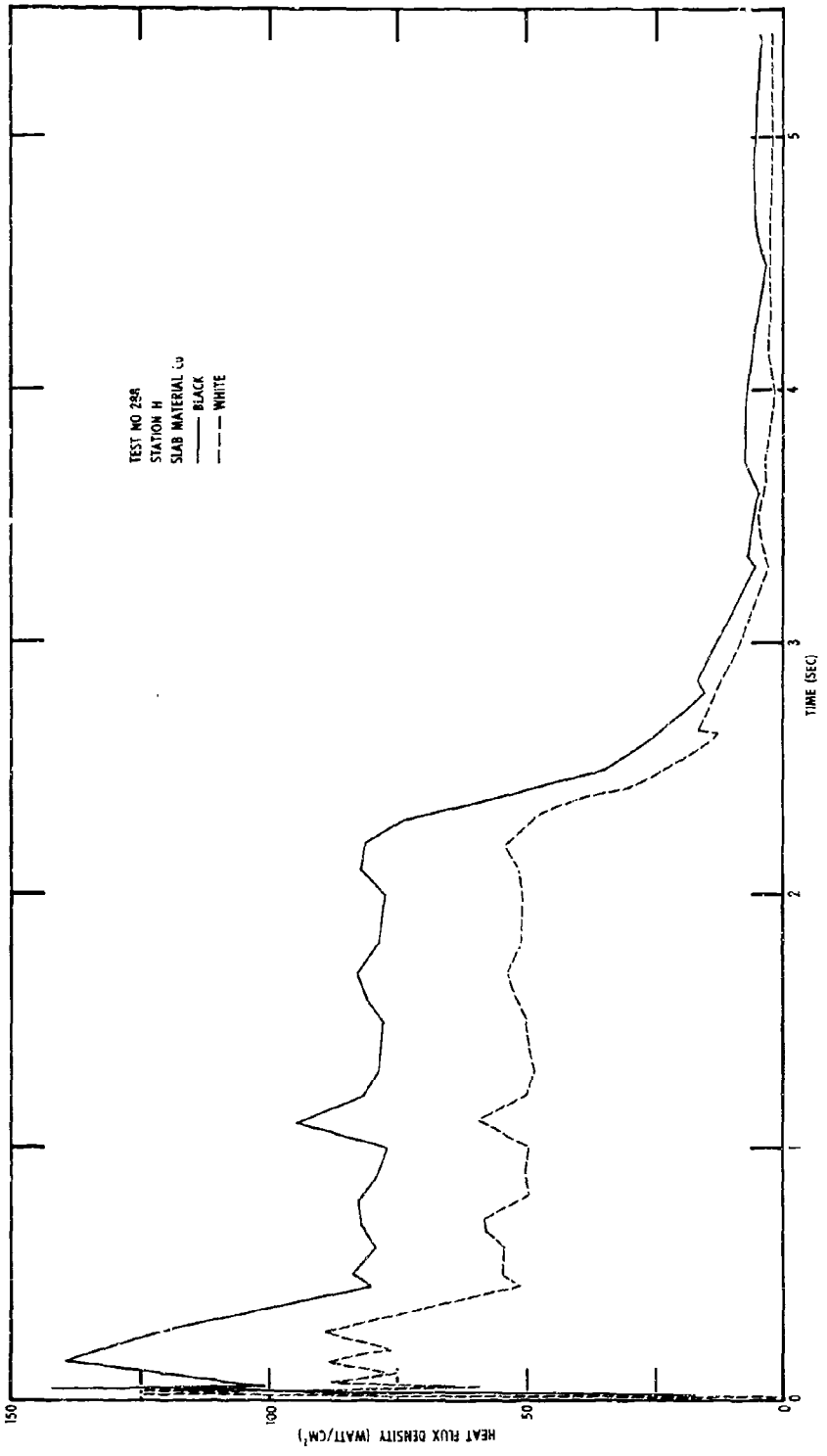


Fig. 2-14. Heat Flux Density at Station H from Test 288

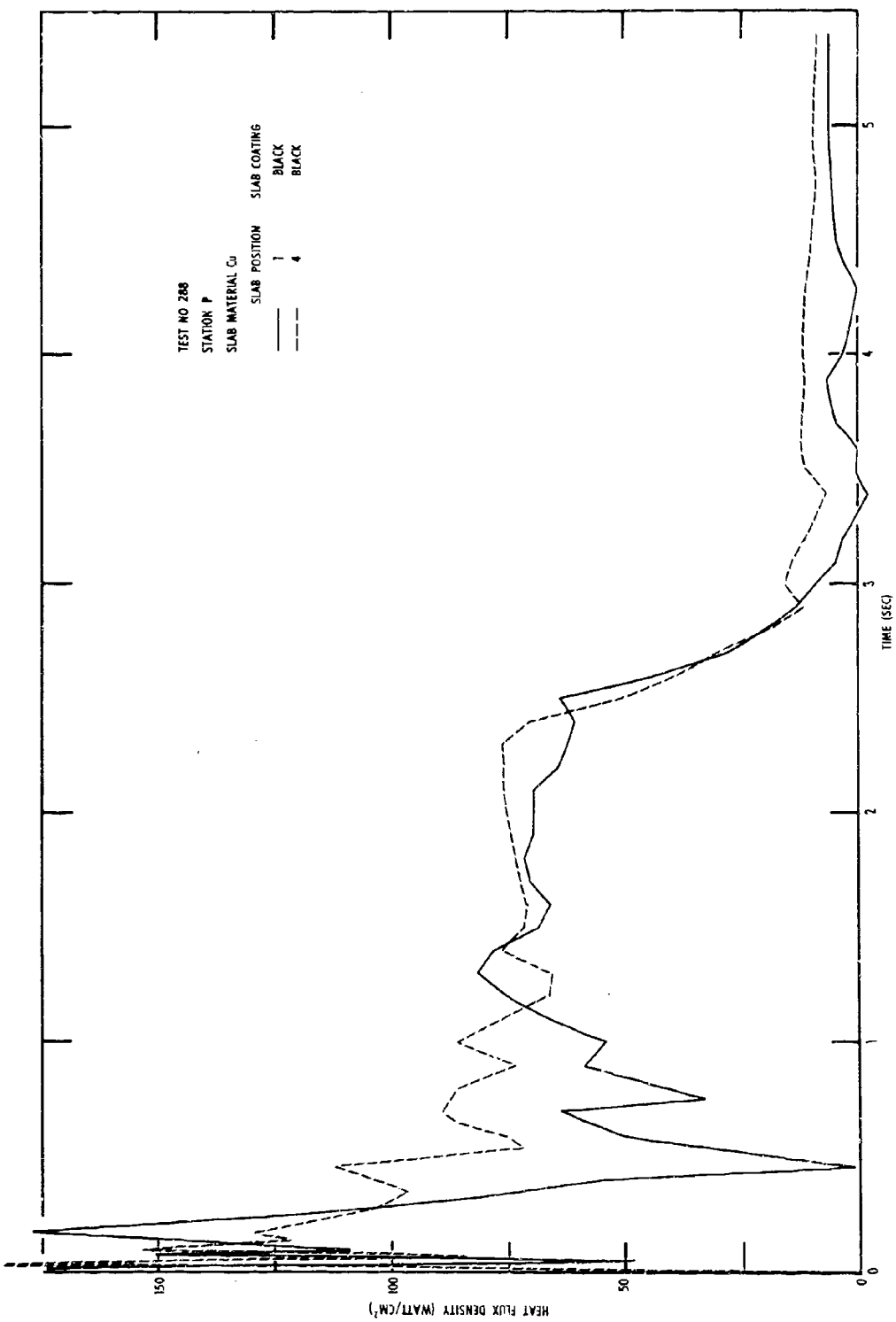


Fig. 2-15. Heat Flux Density at Positions 1 and 4 of Station P from Test 288

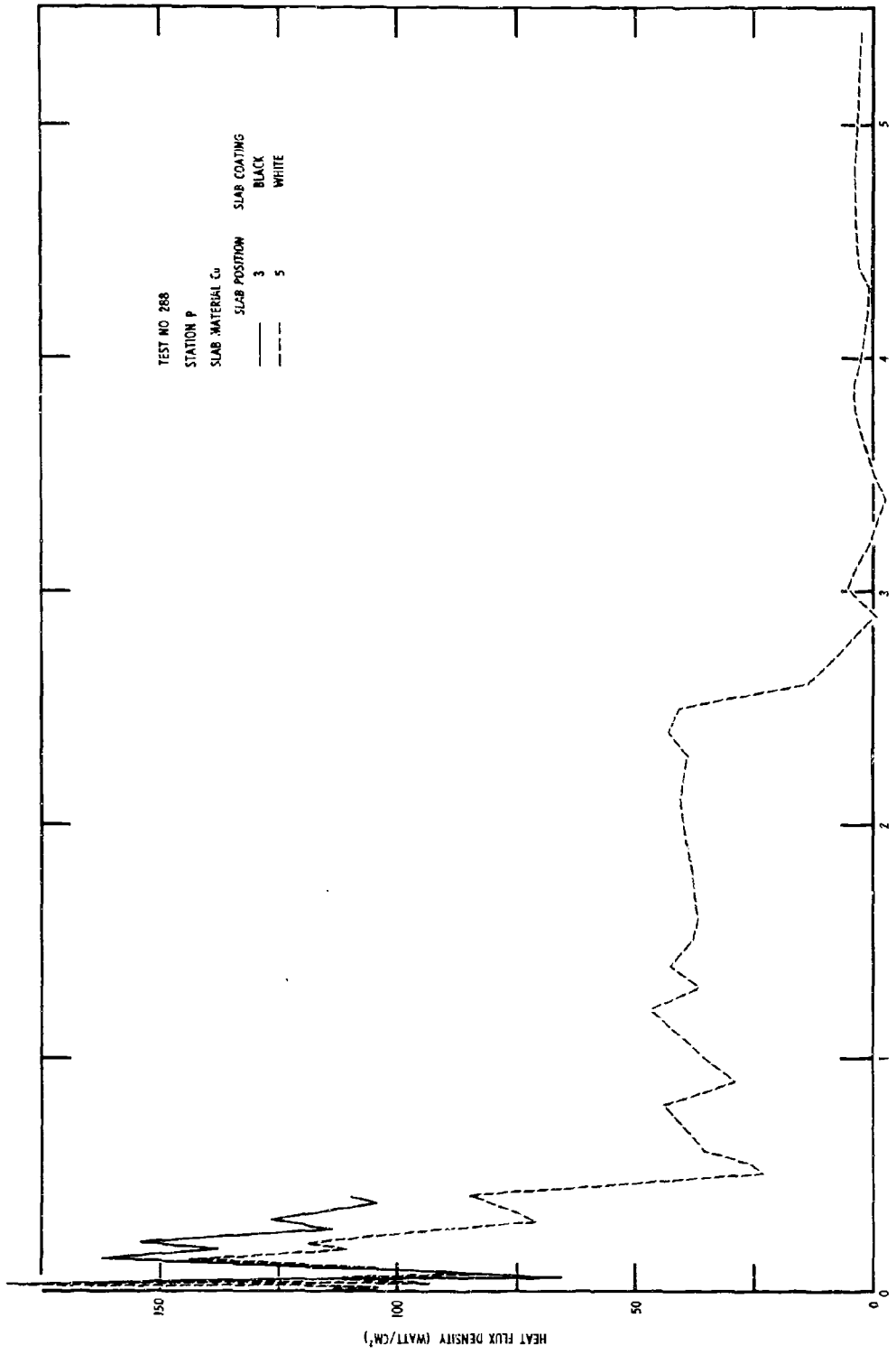


Fig. -16. Heat Flux Density at Positions 3 and 5 of Station P from Test 288

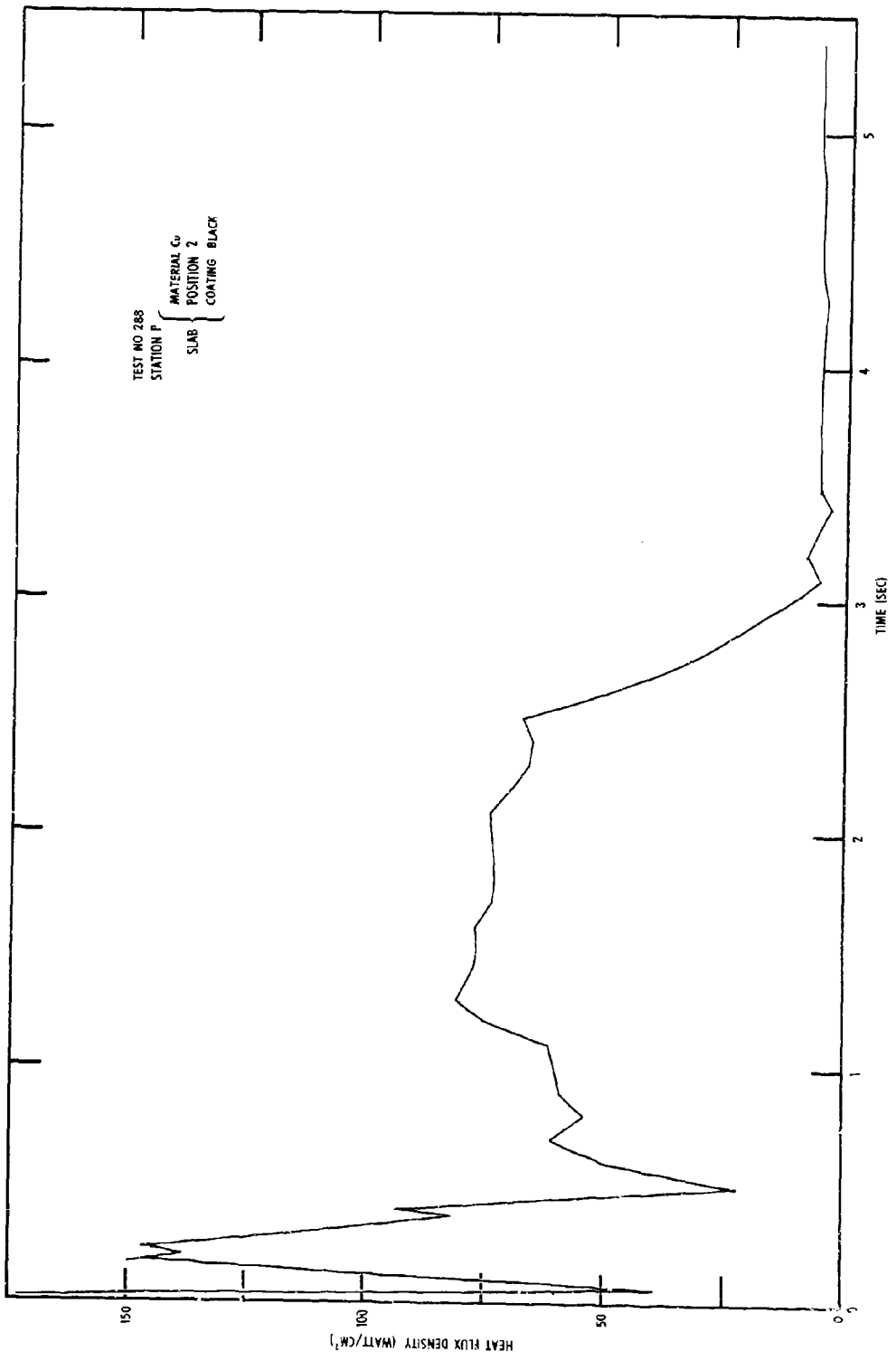


Fig. 2-17. Heat Flux Density at Position 2 of Station P from Test 288

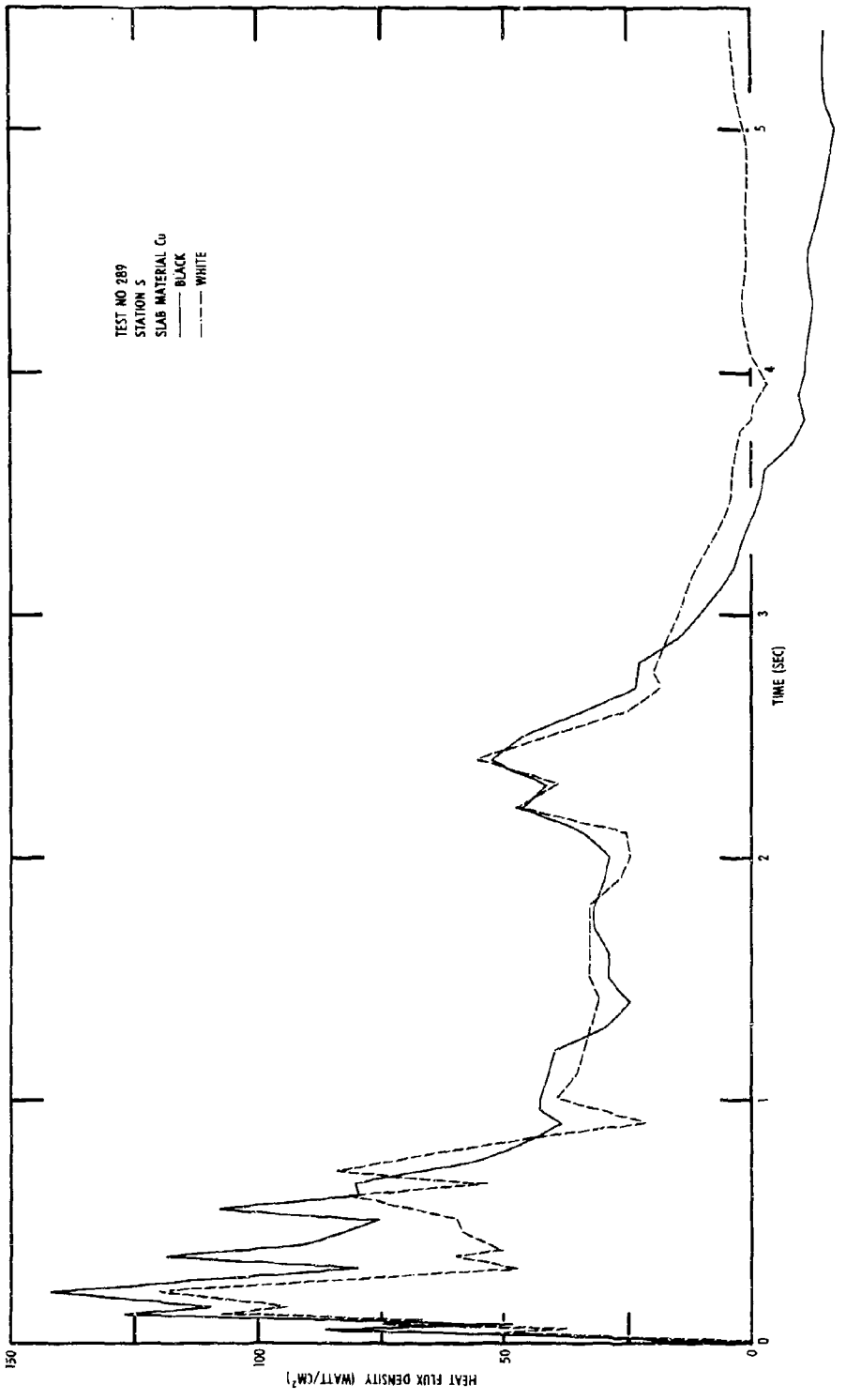


Fig. 2-18. Heat Flux Density at Station S from Test 289

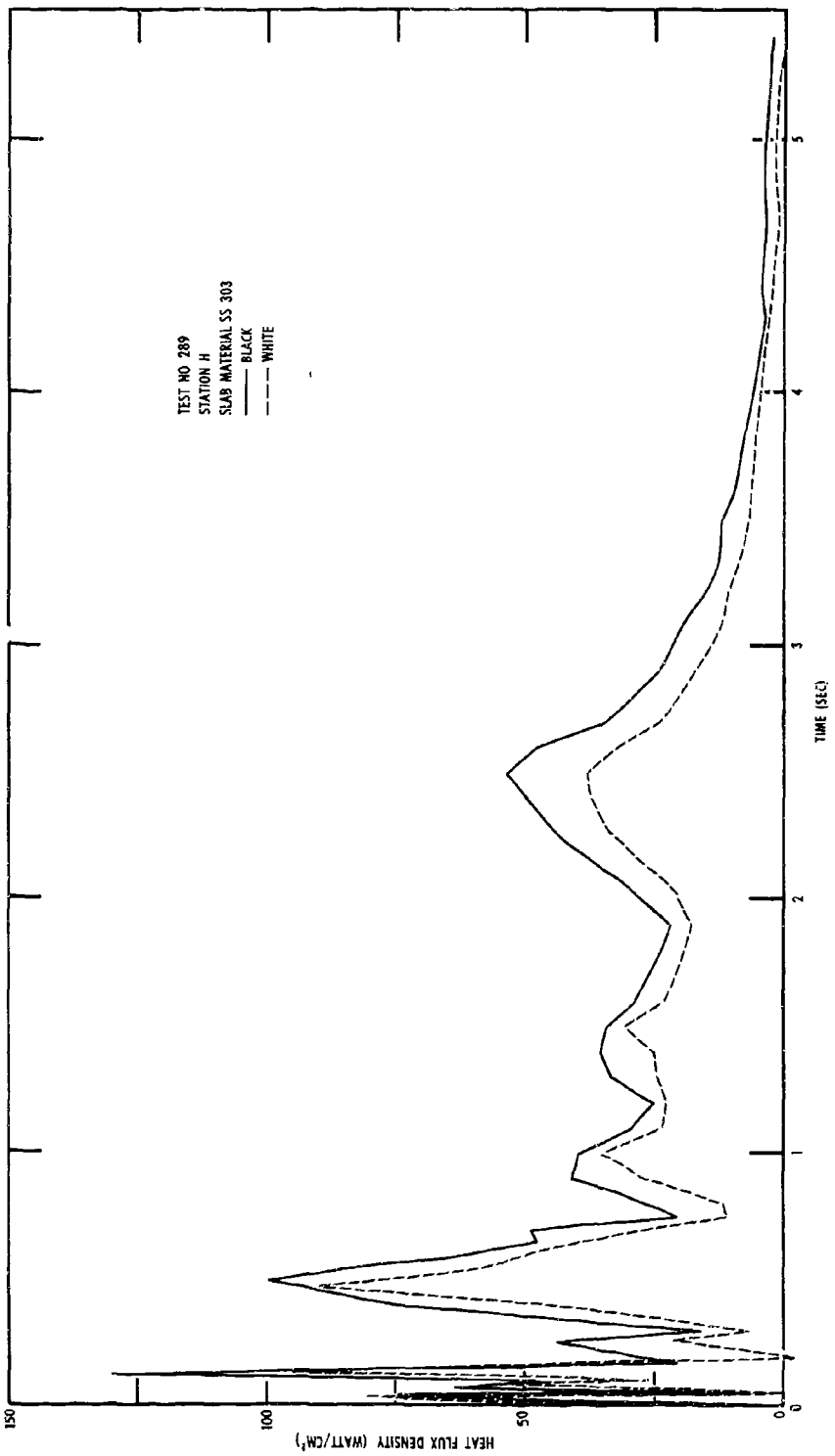


Fig. 2-19. Heat Flux Density at Station H from Test 289

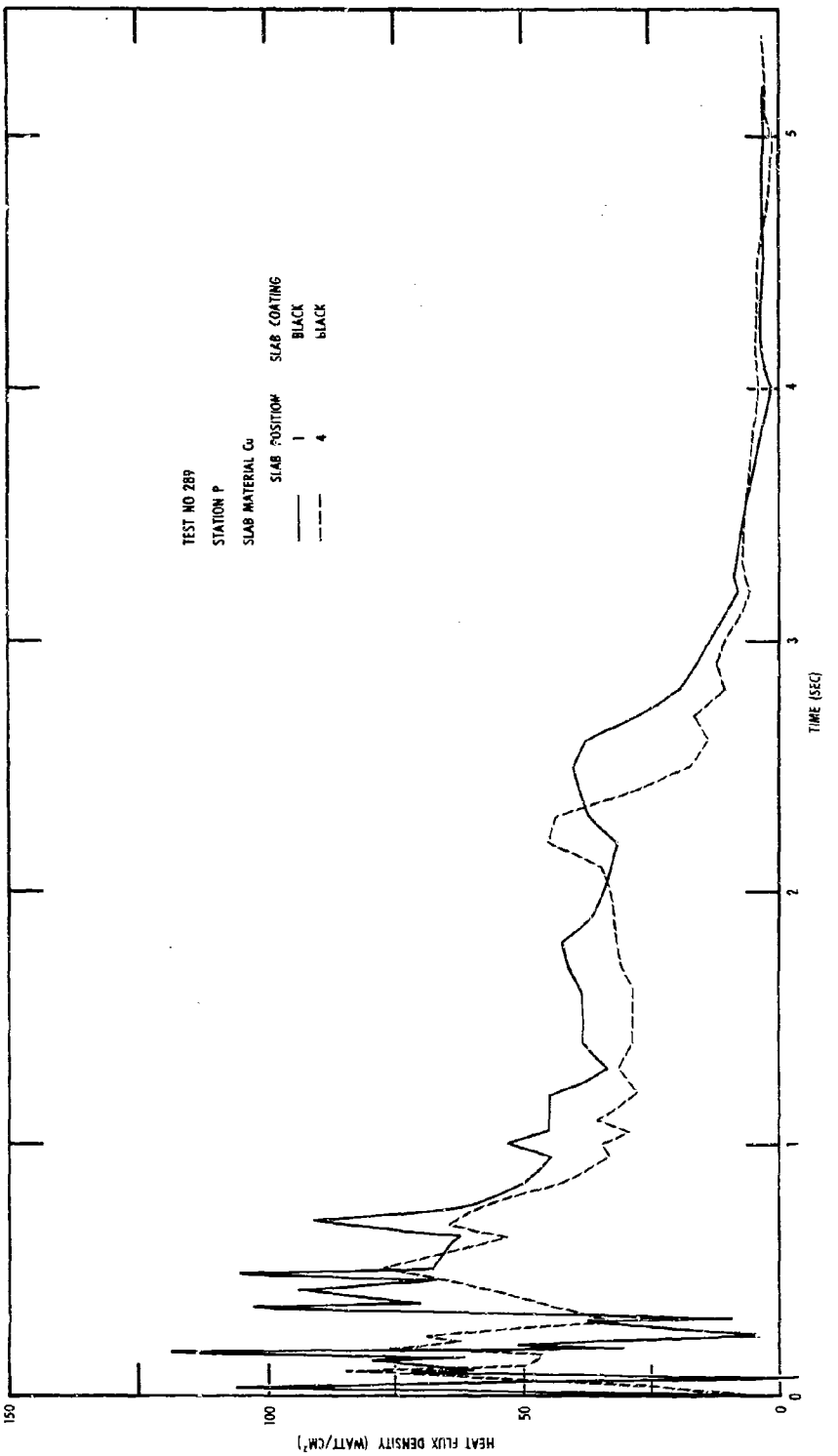


Fig. 2-20. Heat Flux Density at Positions 1 and 4 of Station P from Test 289

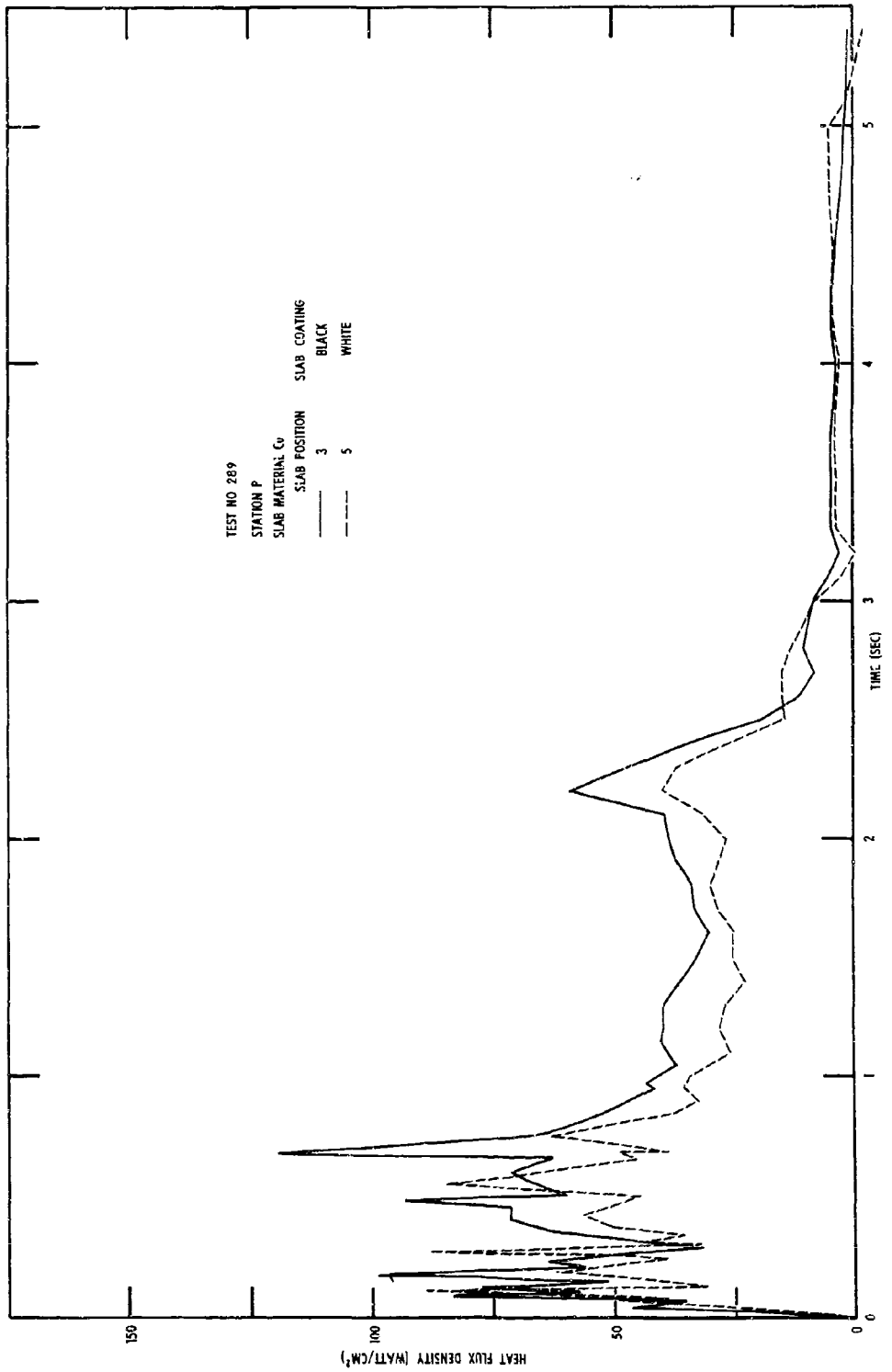


Fig. 2-21. Heat Flux Density at Positions 3 and 5 of Station P from Test 289

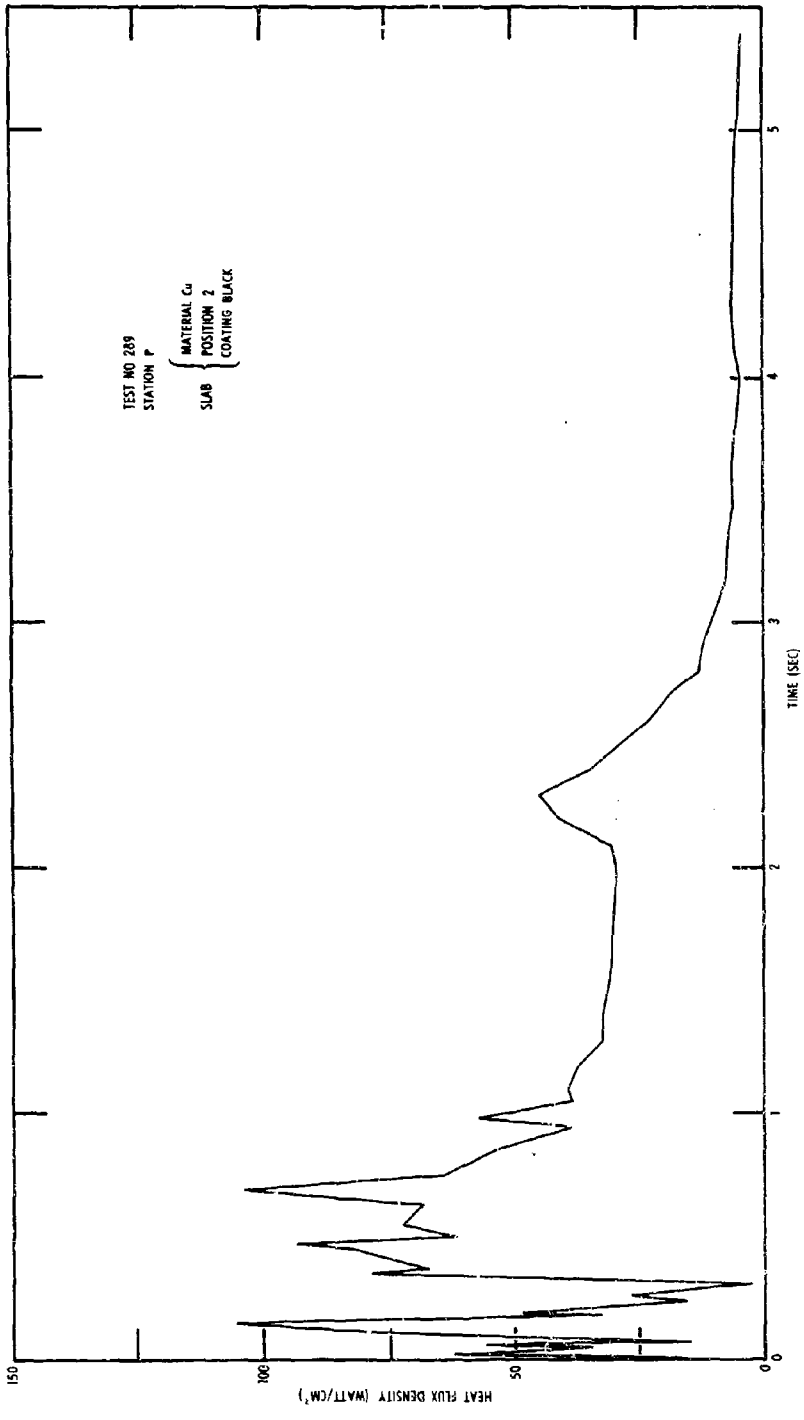


Fig. 2-22. Heat Flux Density at Position 2 of Station P from Test 289

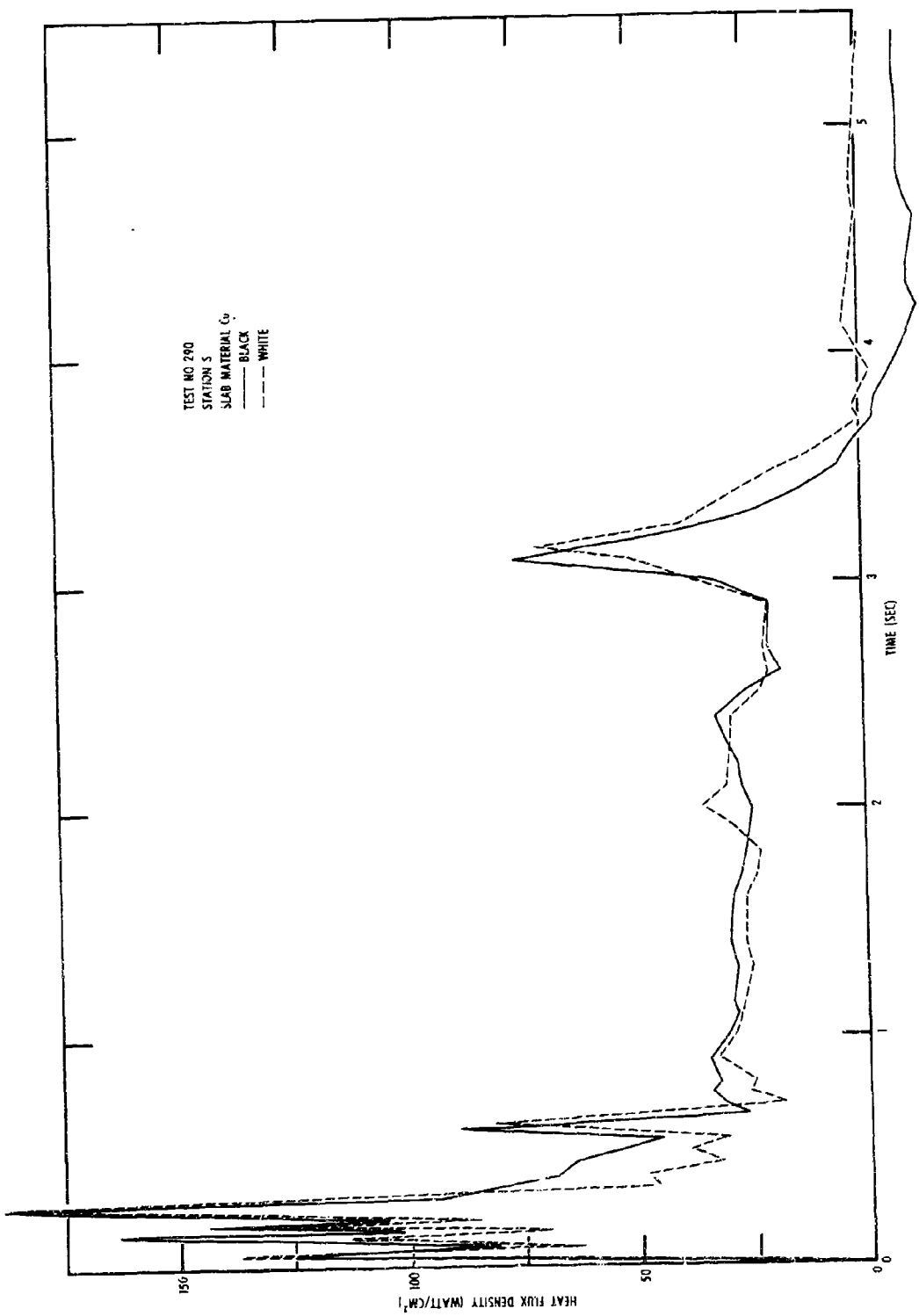


Fig. 2-23. Heat Flux Density at Station S from Test 290

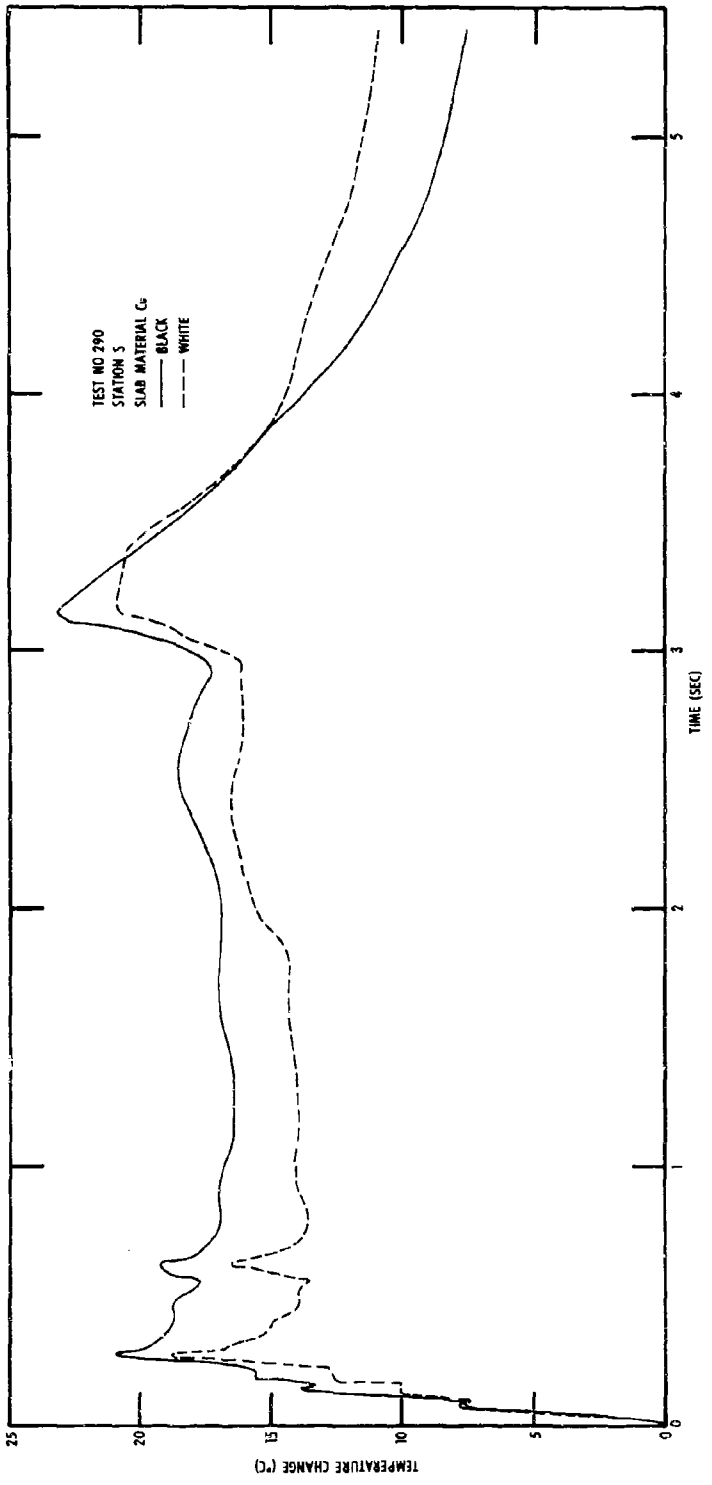


Fig. 2-24. Slab Surface Temperature at Station S from Test 290

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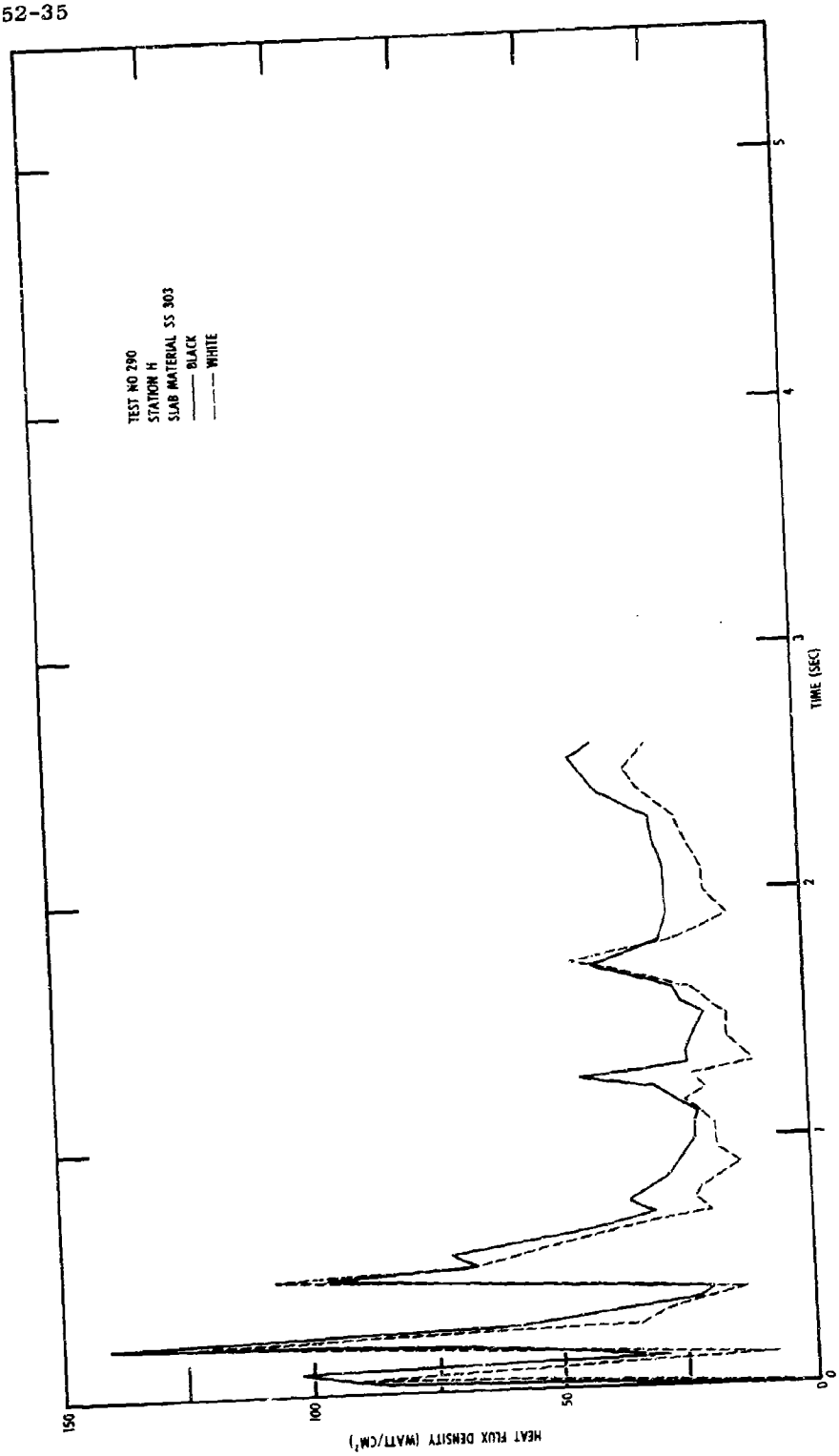


Fig. 2-25. Heat Flux Density at Station H from Test 290

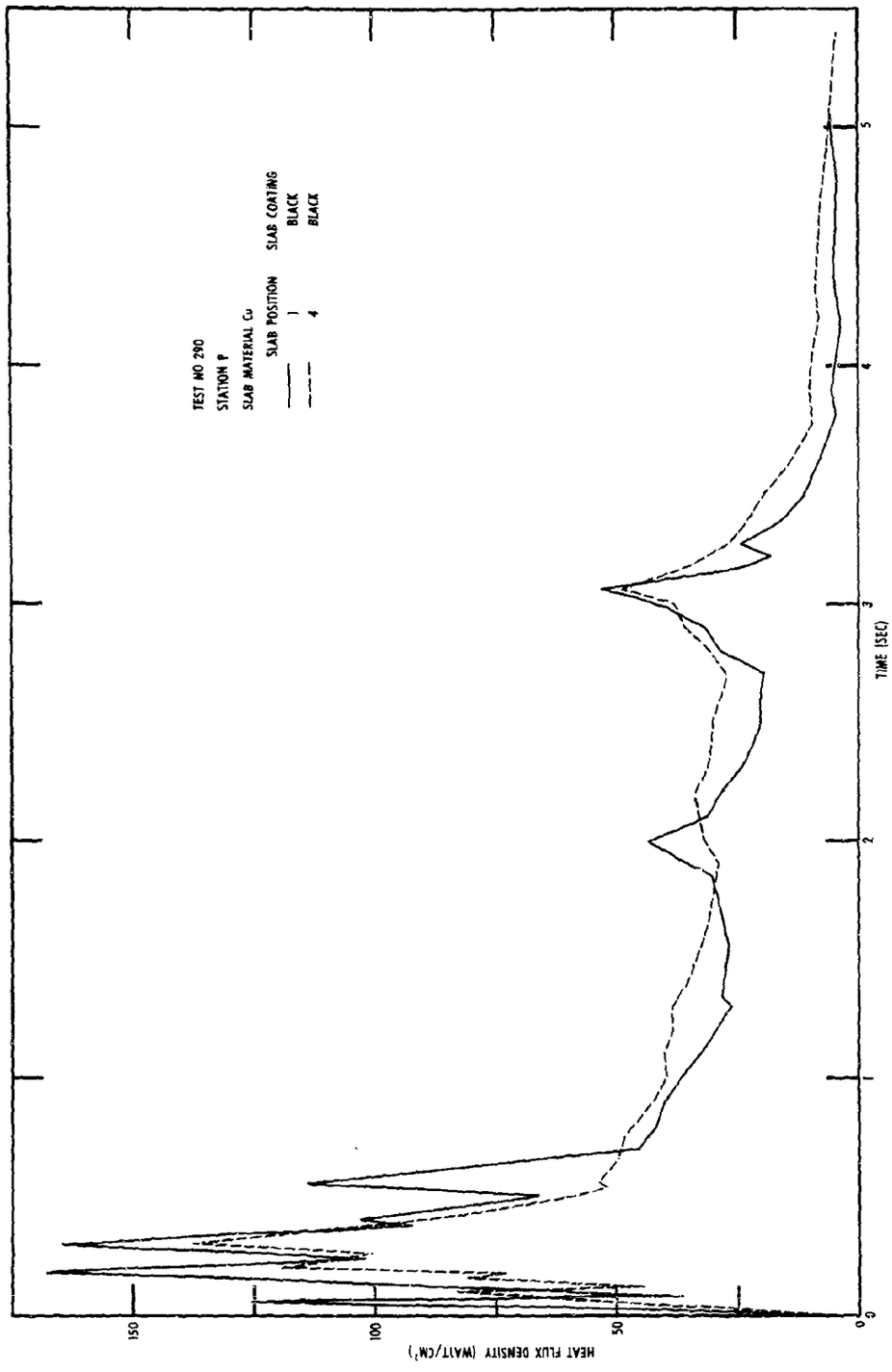


Fig. 2-26. Heat Flux Density at Positions 1 and 4 of Station P from Test 290

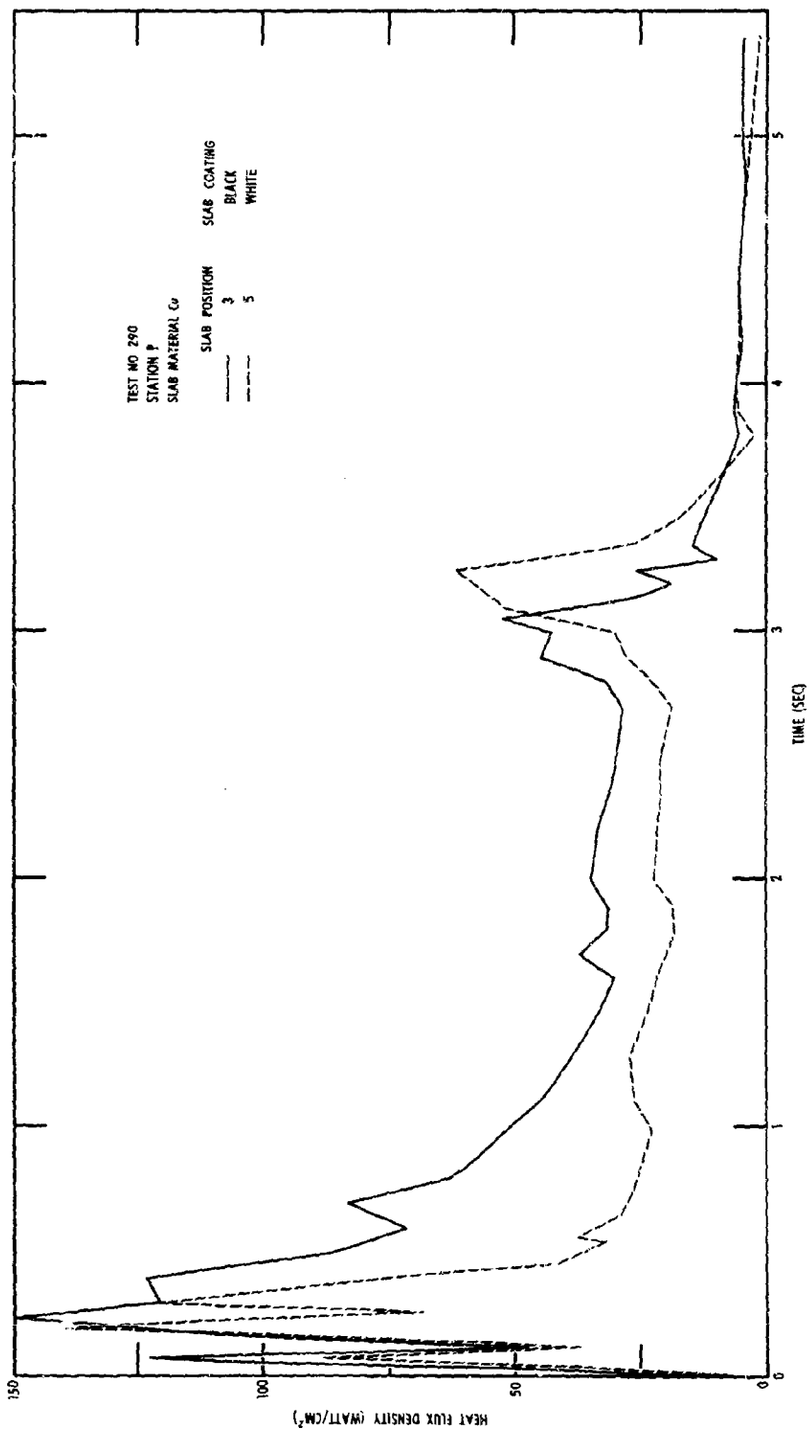


Fig. 2-27. Heat Flux Density at Positions 3 and 5 of Station P from Test 290

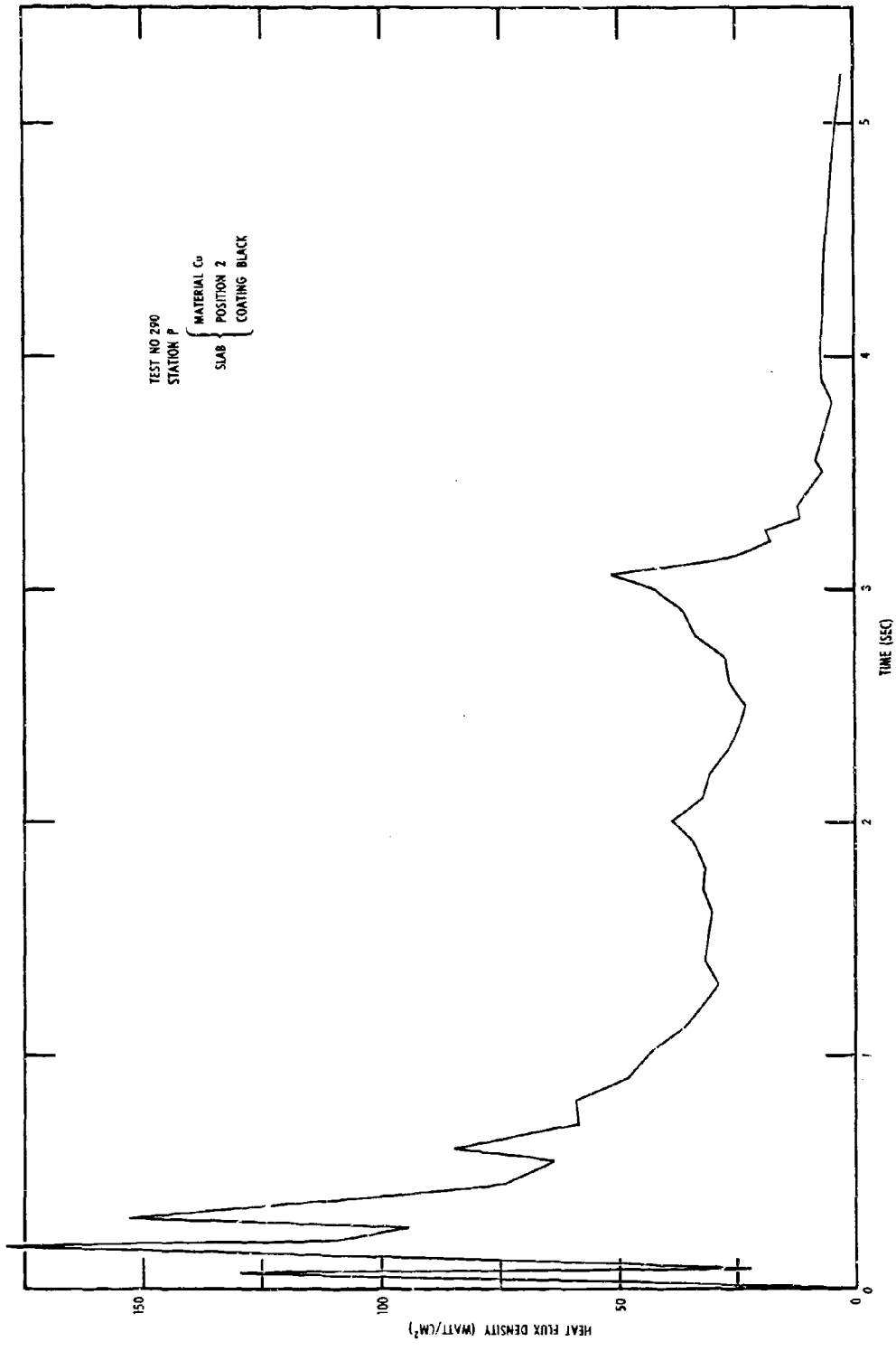


Fig. 2-28. Heat Flux Density at Position 2 of Station P from Test 290

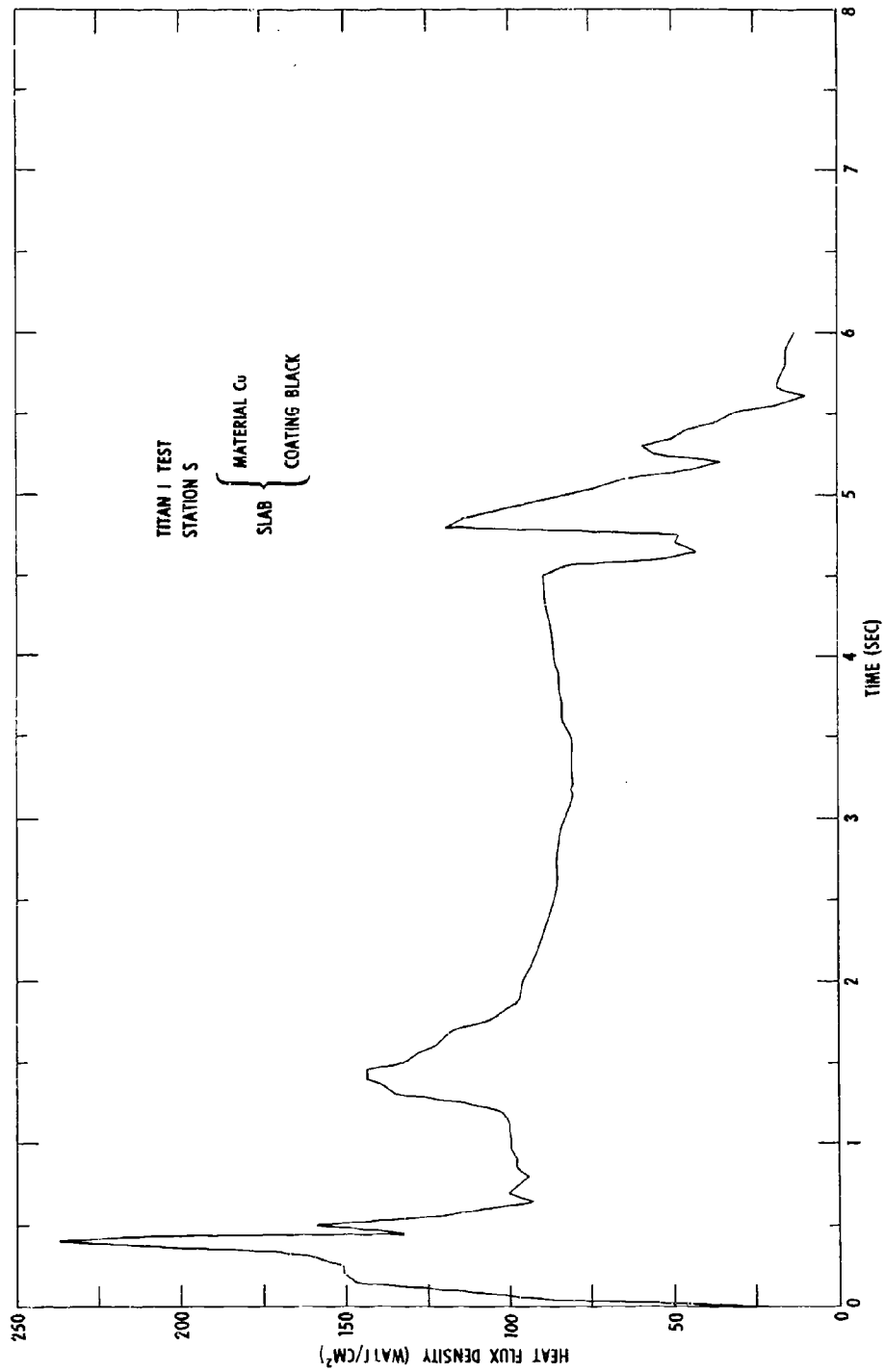


Fig. 2-29. Heat Flux Density at Station S from the Titan I Test

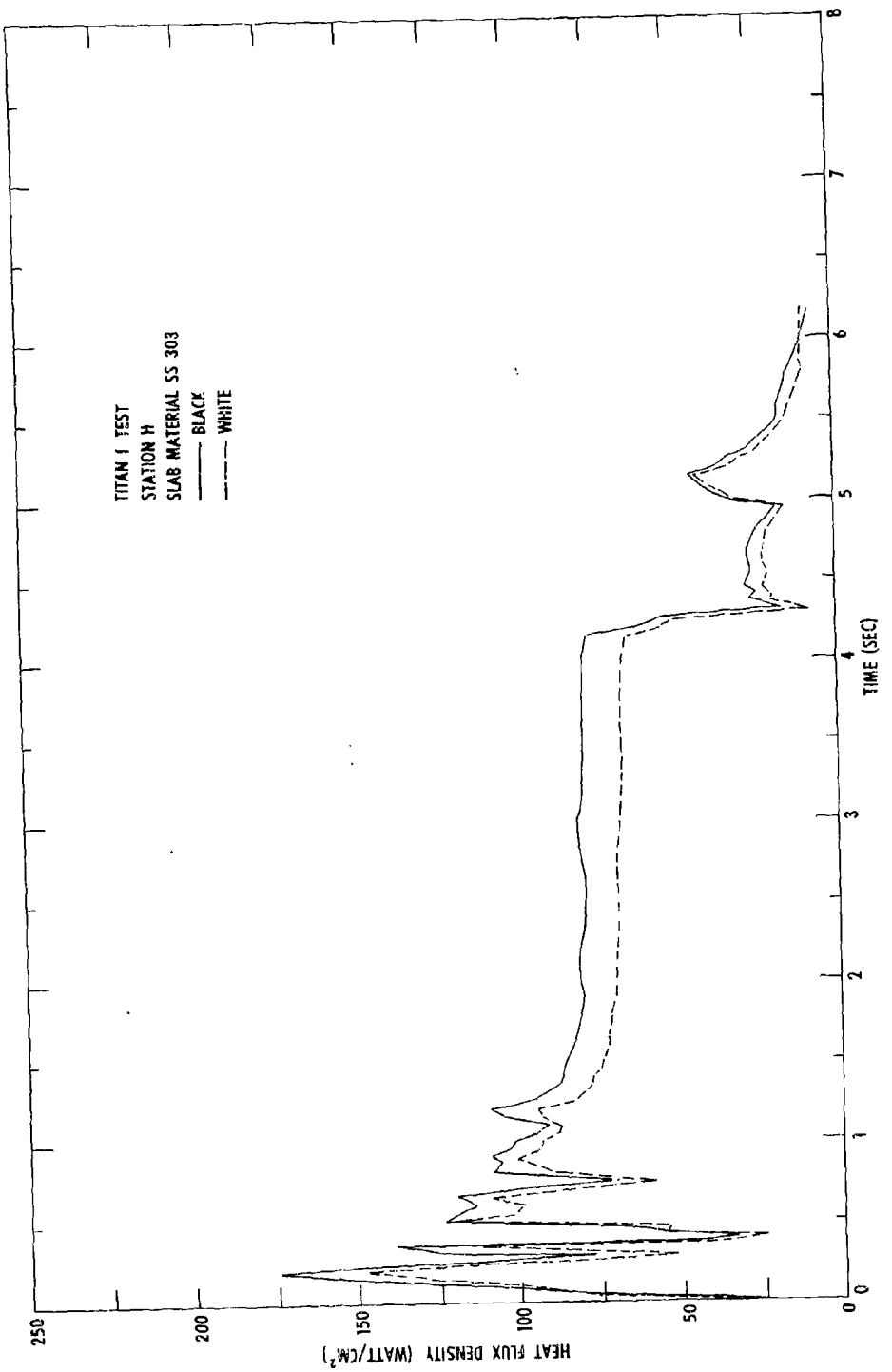


Fig. 2-30. Heat Flux Density at Station H from the Titan I Test

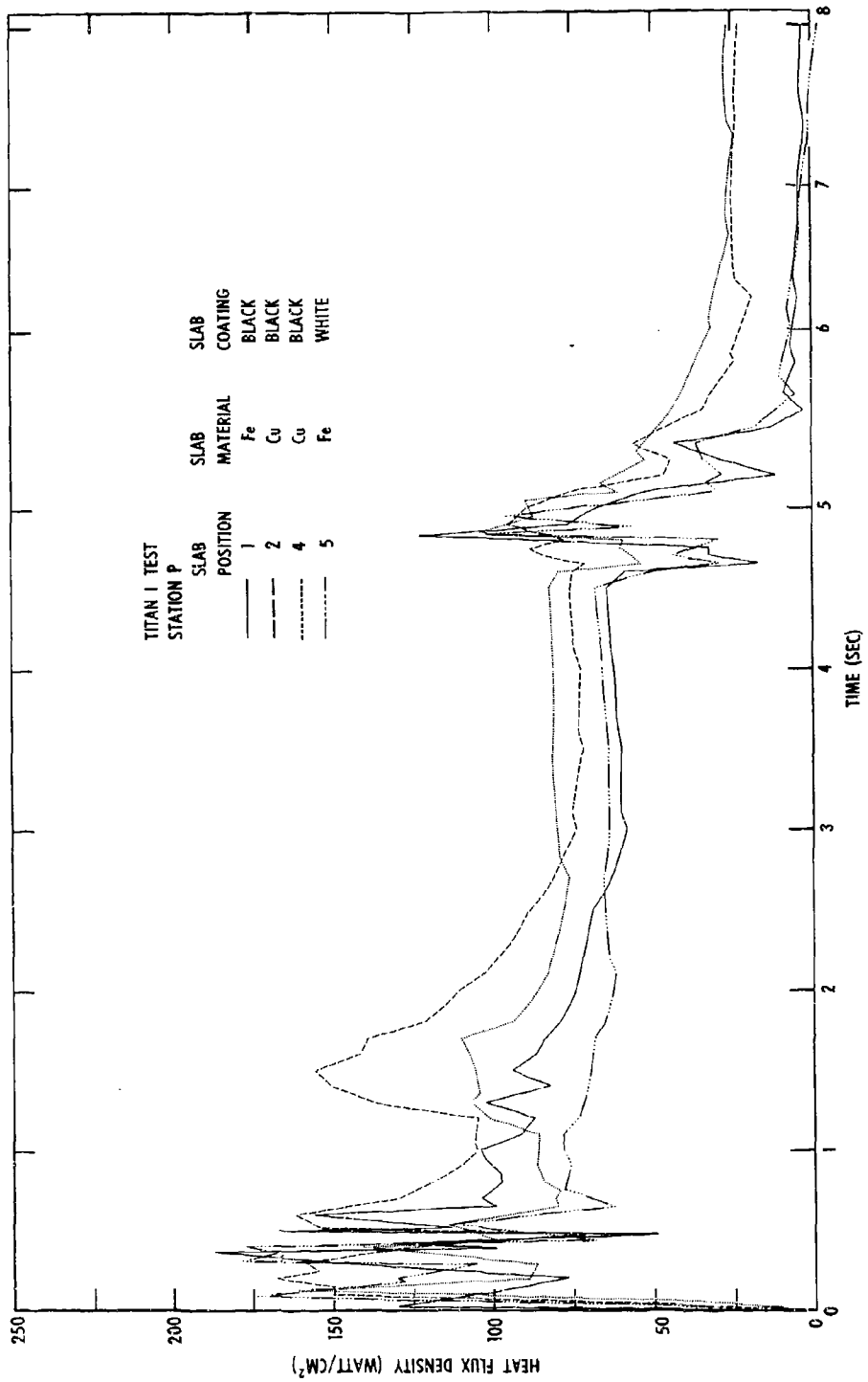


Fig. 2-31. Heat Flux Density at Station P from the Titan I Test

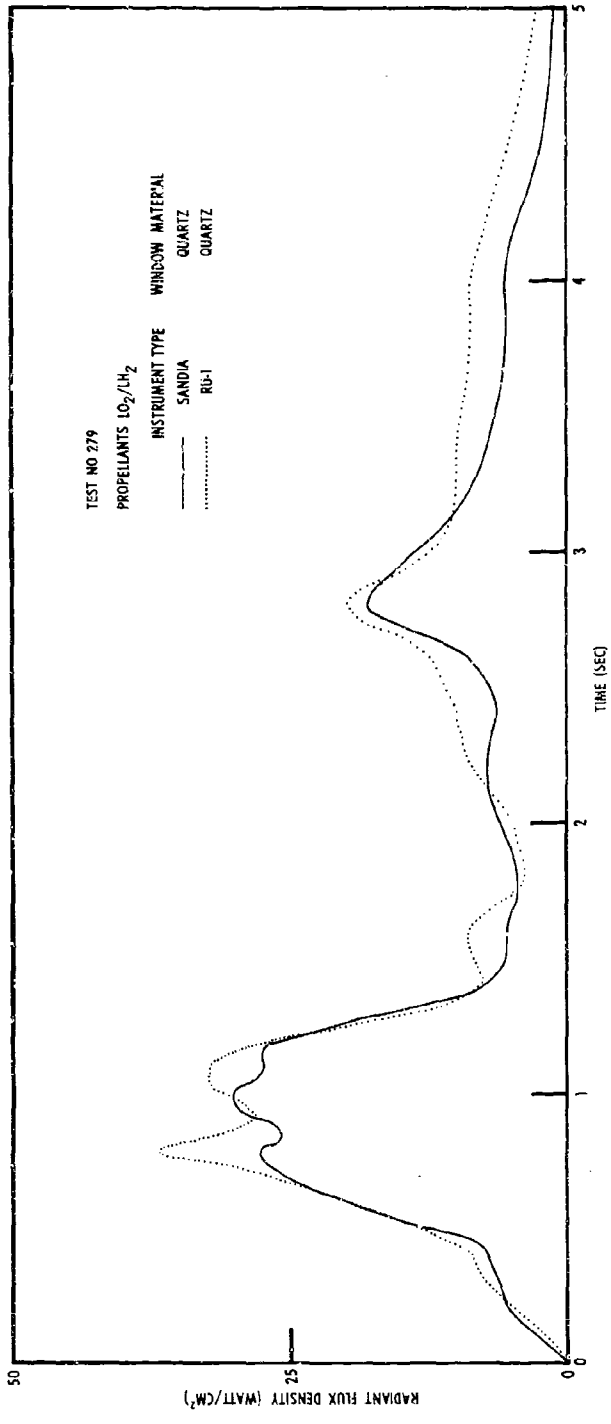


Fig. 2-32. Radiant Flux Density Within the Fireball from Test 279

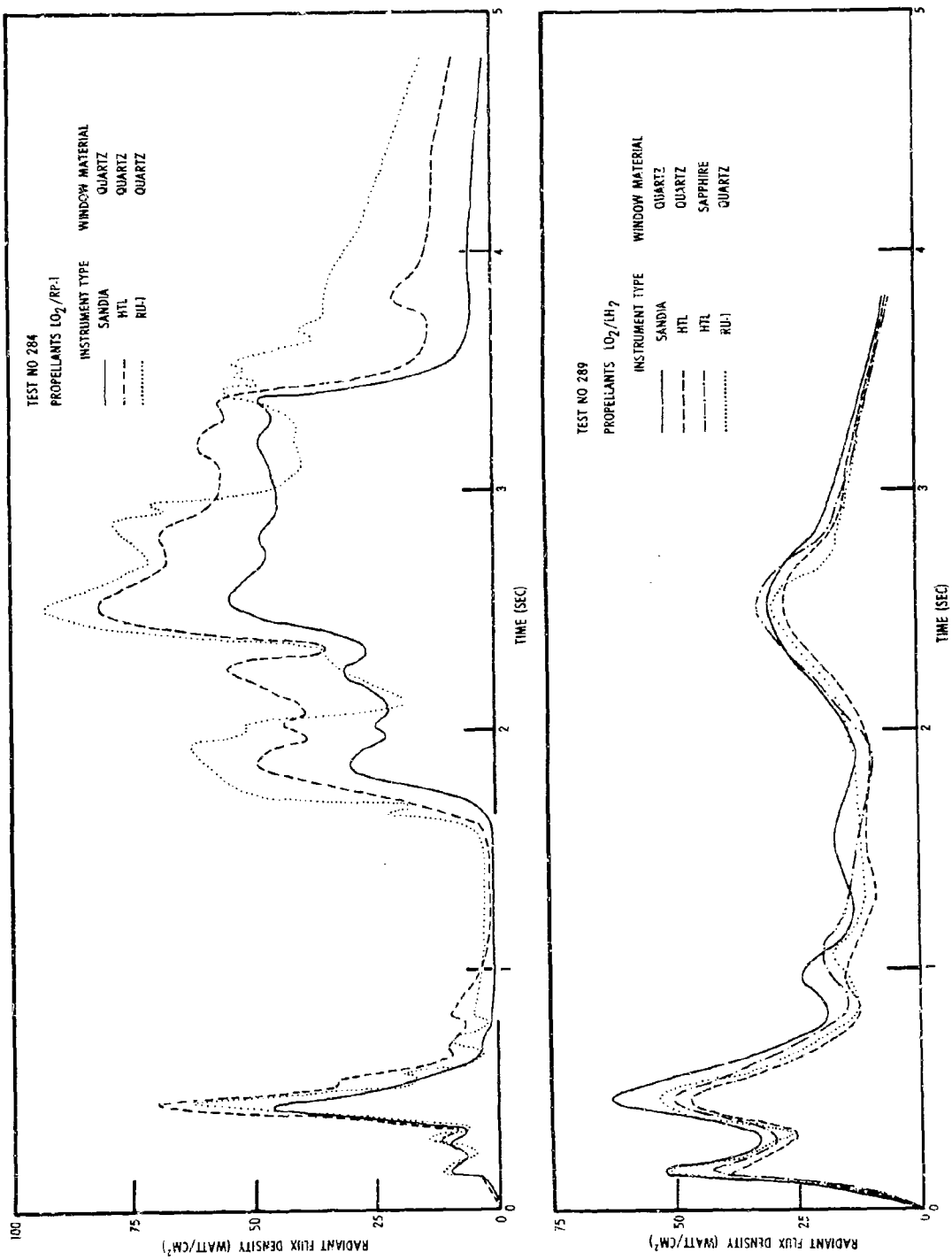


Fig. 2-33. Radiant Flux Density Within the Fireball from Tests 284 and 289

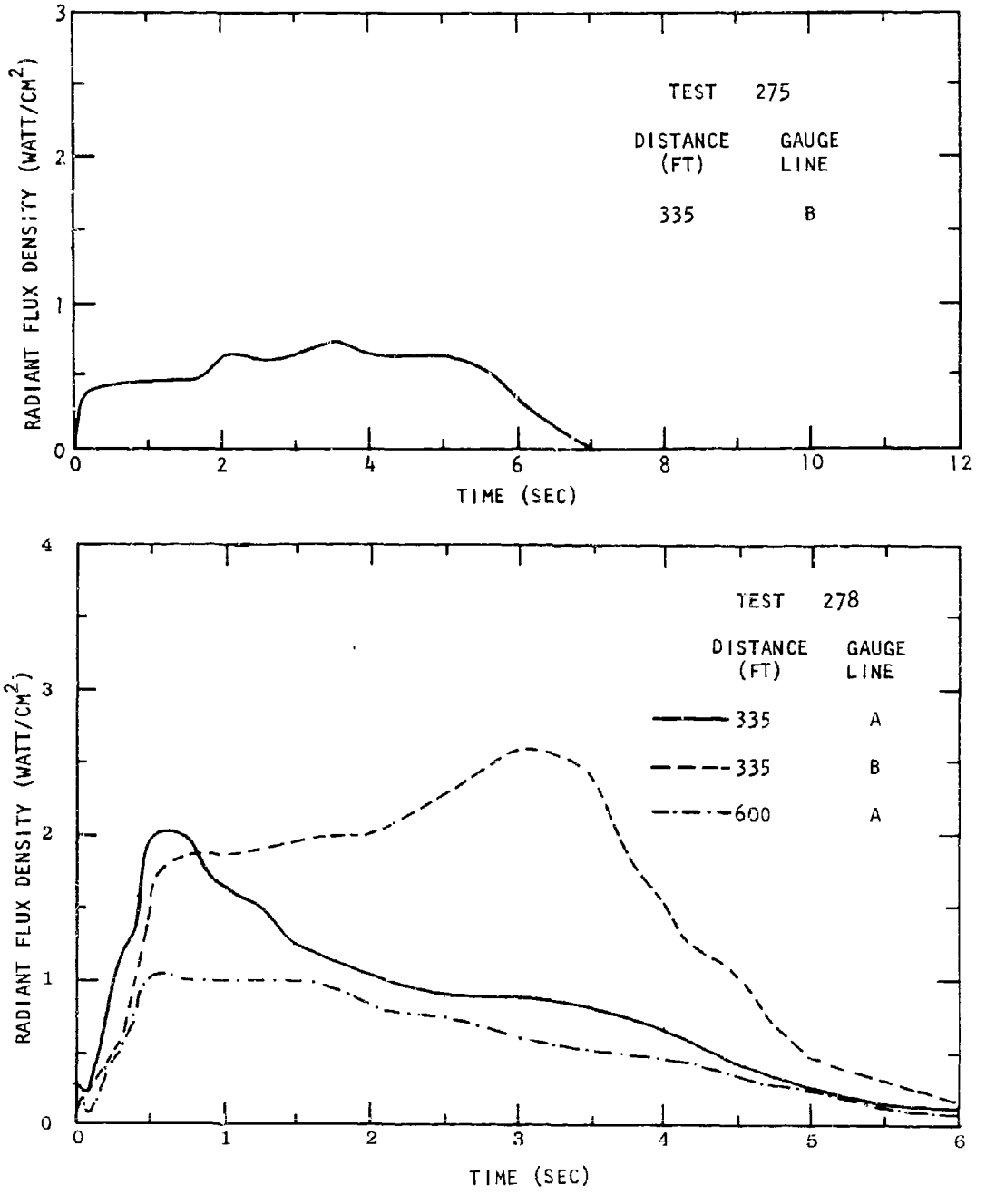


Fig. 2-34. Radiant Flux Density Outside the Fireball from Tests 275 and 278

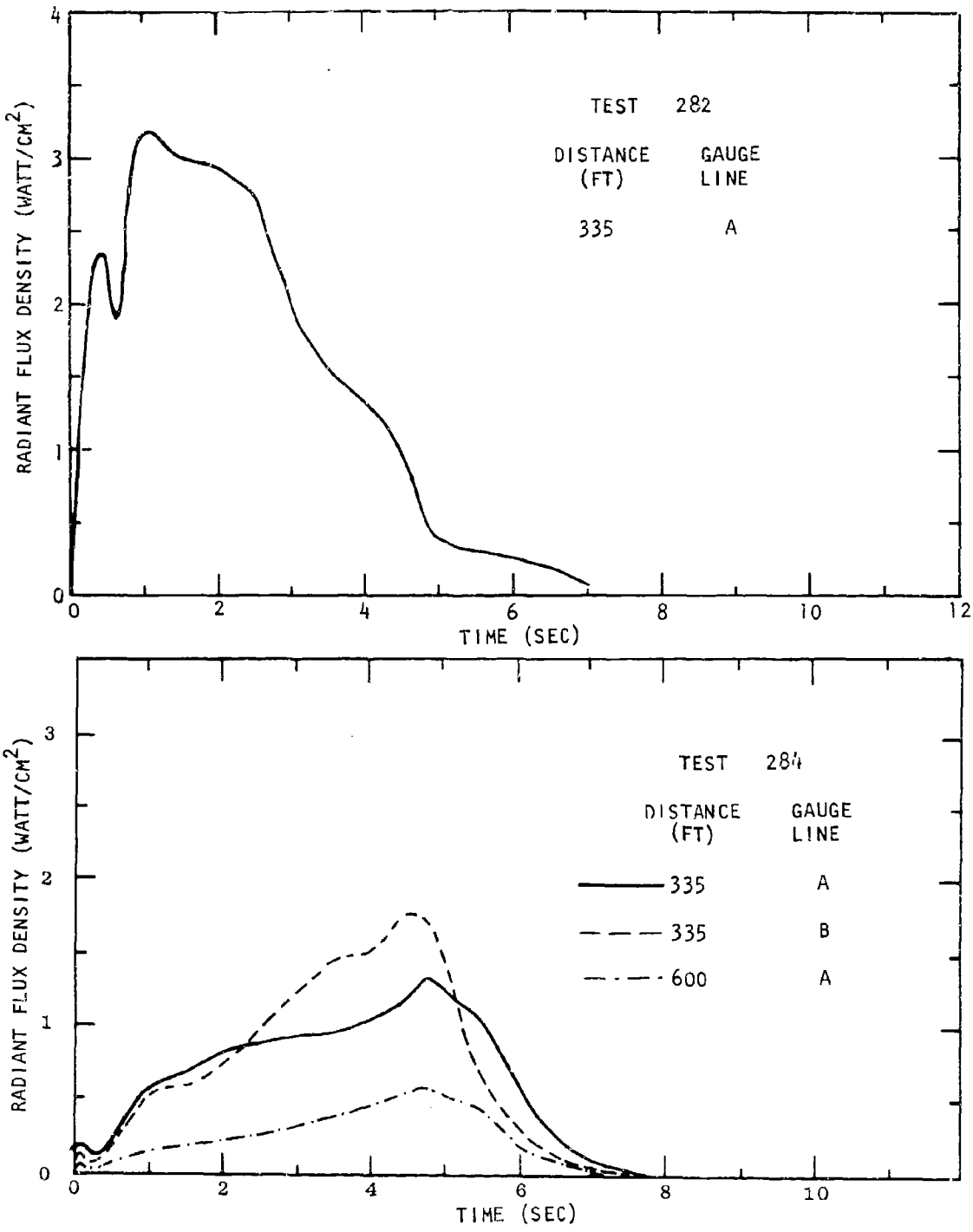


Fig. 2-35. Radiant Flux Density Outside the Fireball from Tests 282 and 284

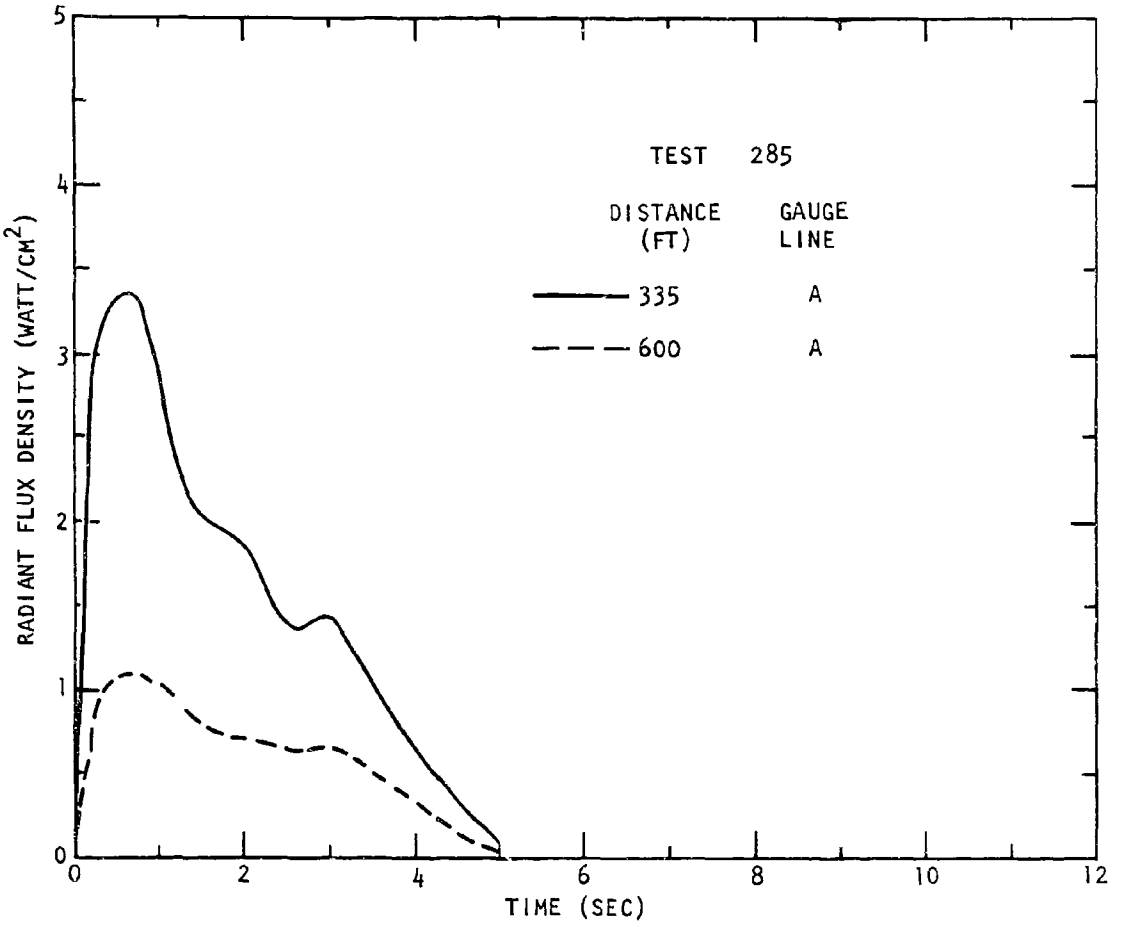


Fig. 2-36. Radiant Flux Density Outside the Fireball from Test 285

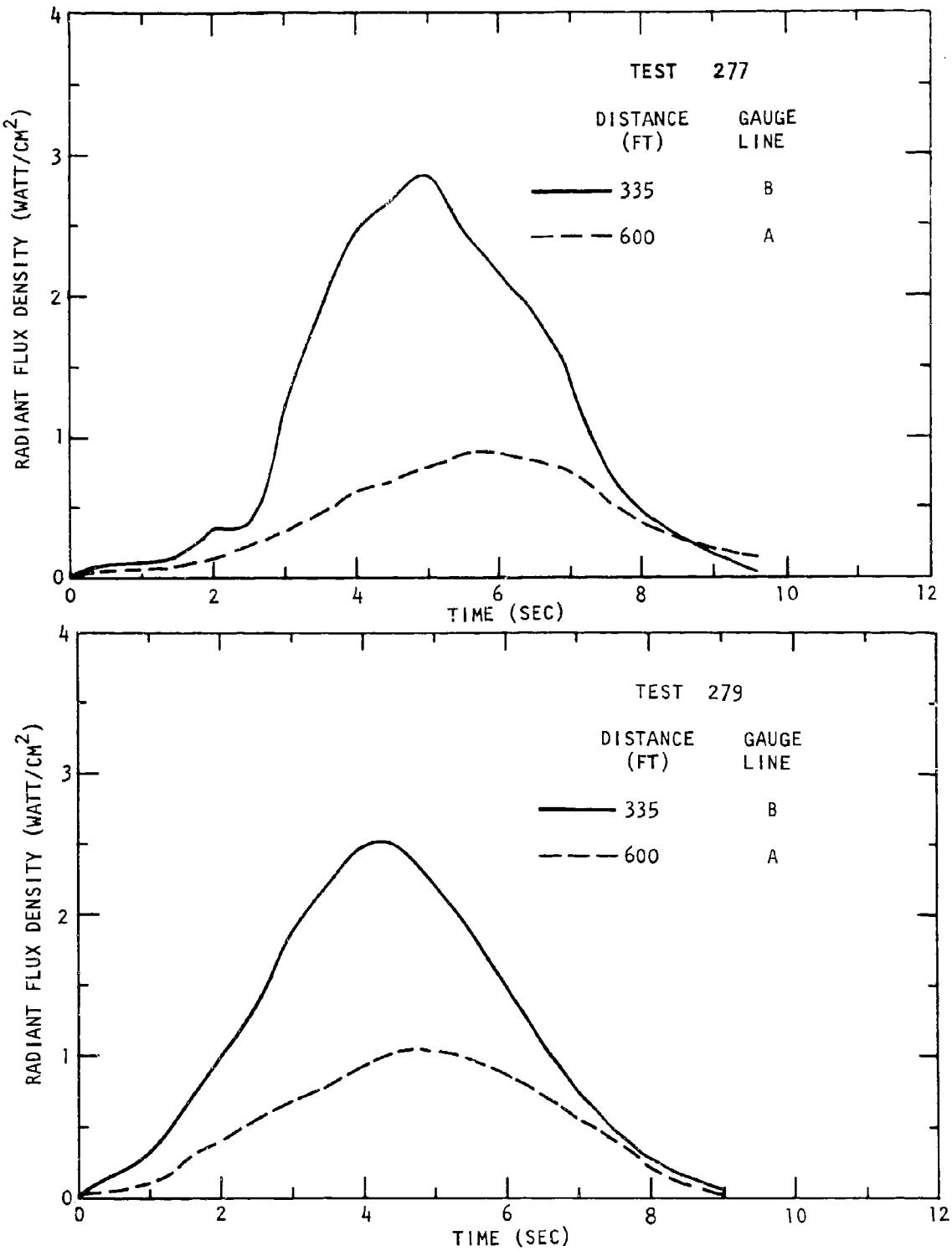


Fig. 2-37. Radiant Flux Density Outside the Fireball from Tests 277 and 279

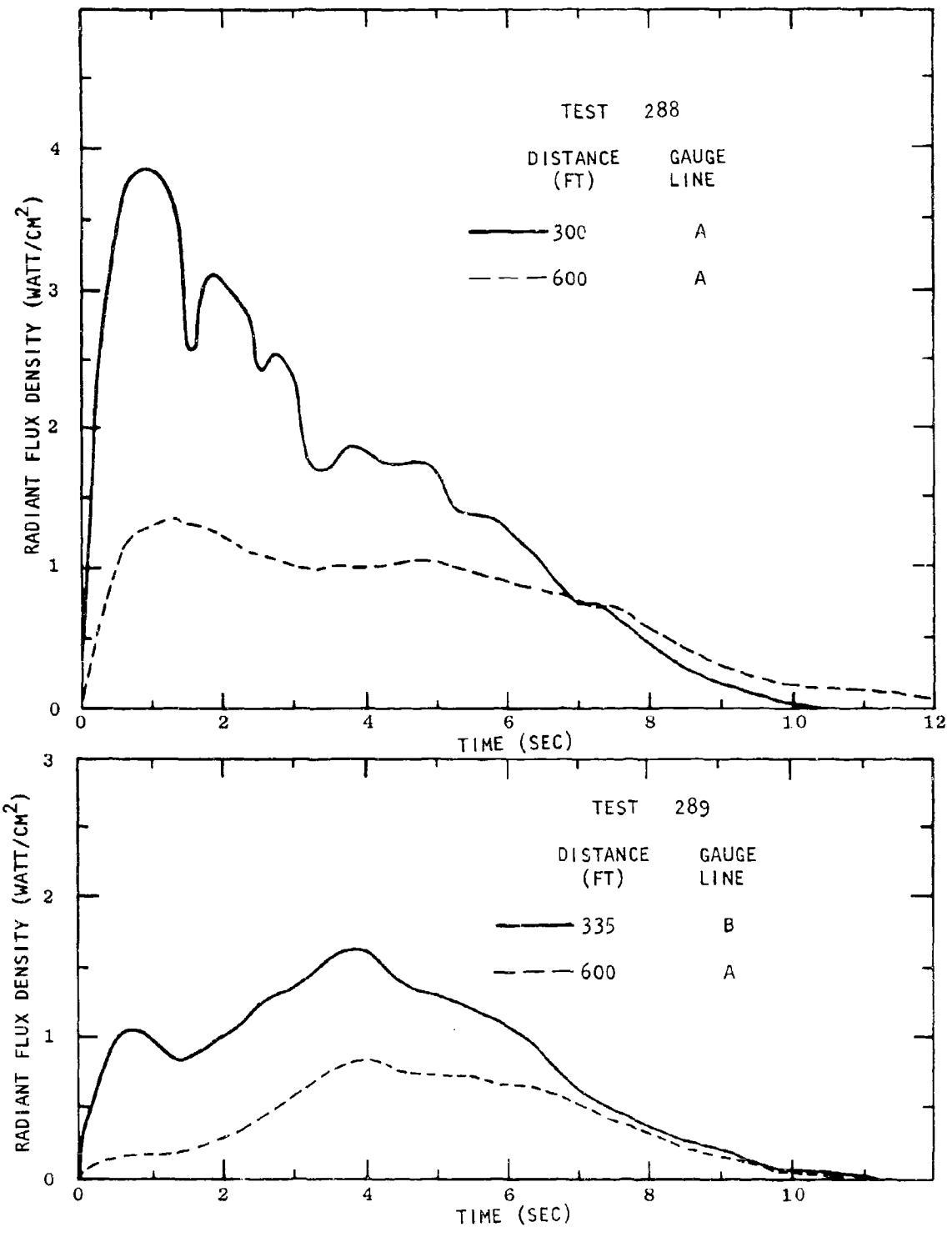


Fig. 2-38. Radiant Flux Density Outside the Fireball from Tests 288 and 289

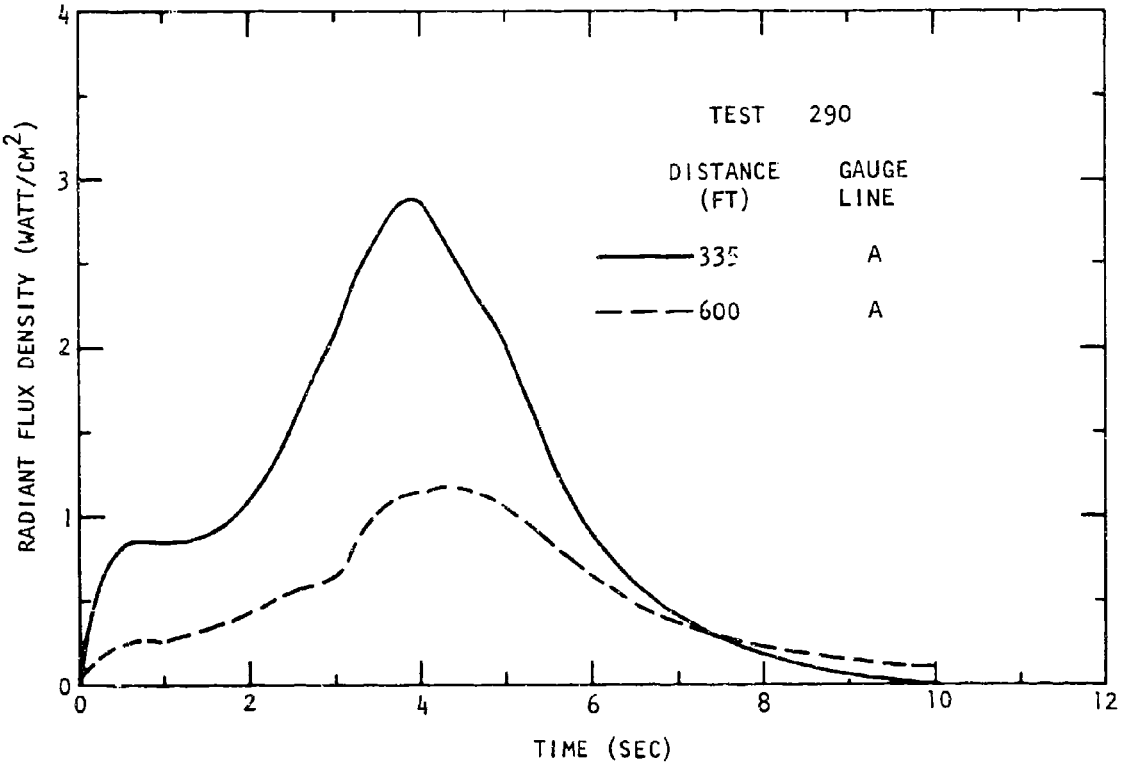


Fig. 2-39. Radiant Flux Density Outside the Fireball from Test 290

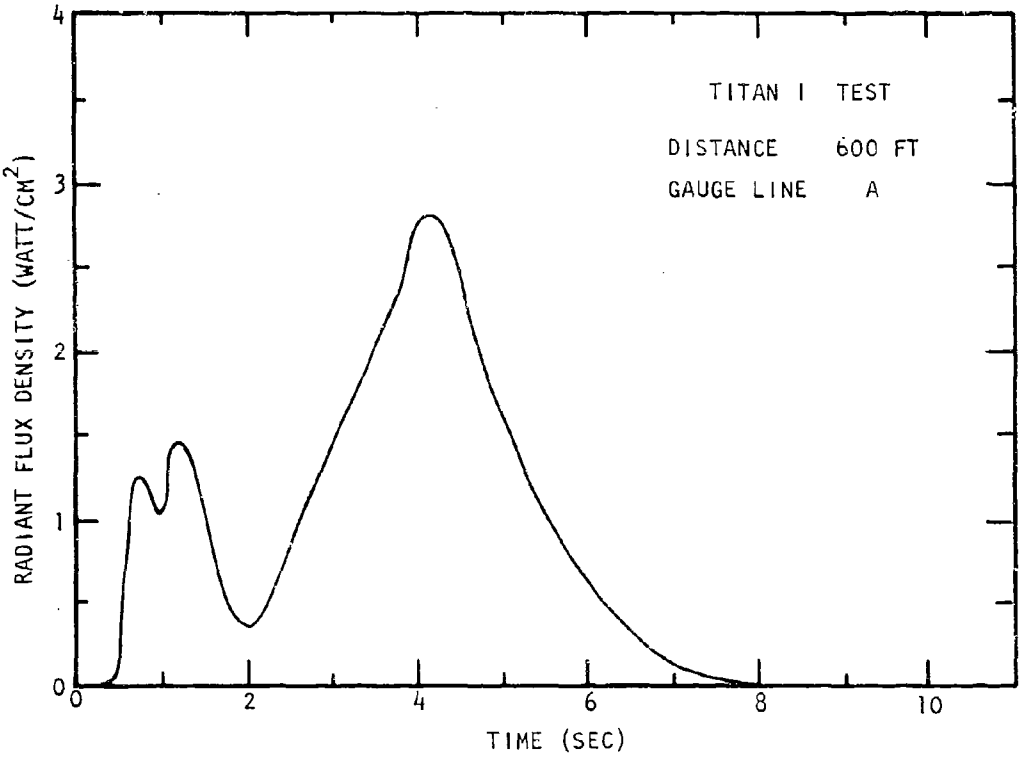
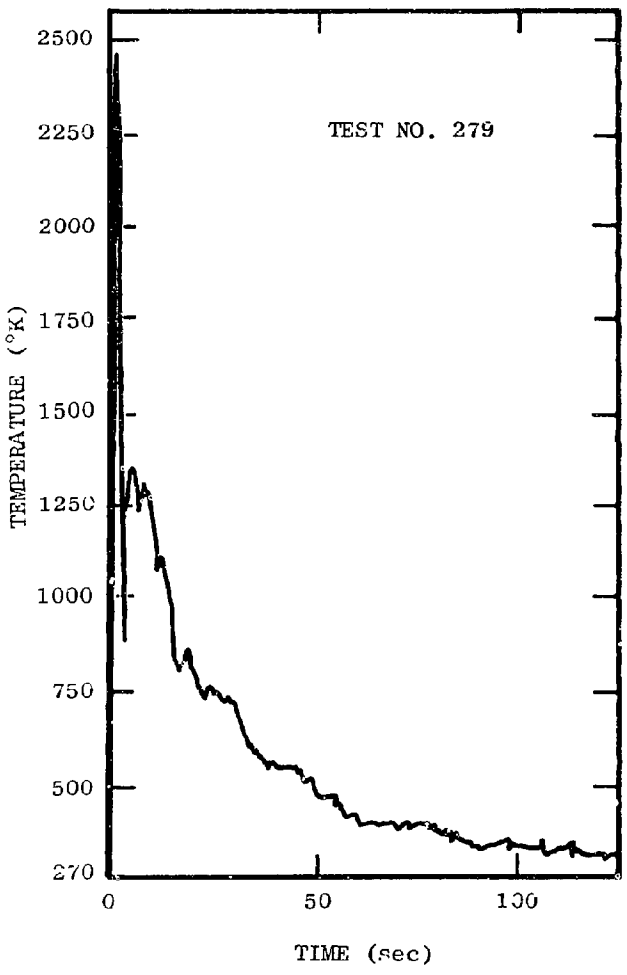
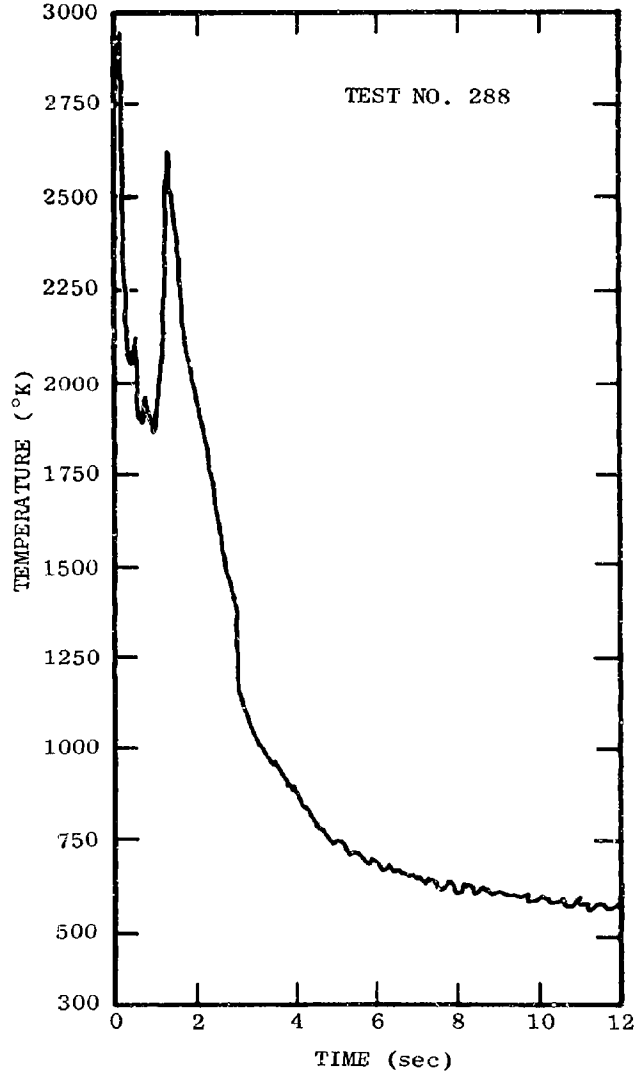


Fig. 2-40. Radiant Flux Density Outside the Fireball from the Titan I Test





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AFRPL-TR-68-92

Fig. 2-41. Temperature of Thermocouple Probes for Tests 279 and 288

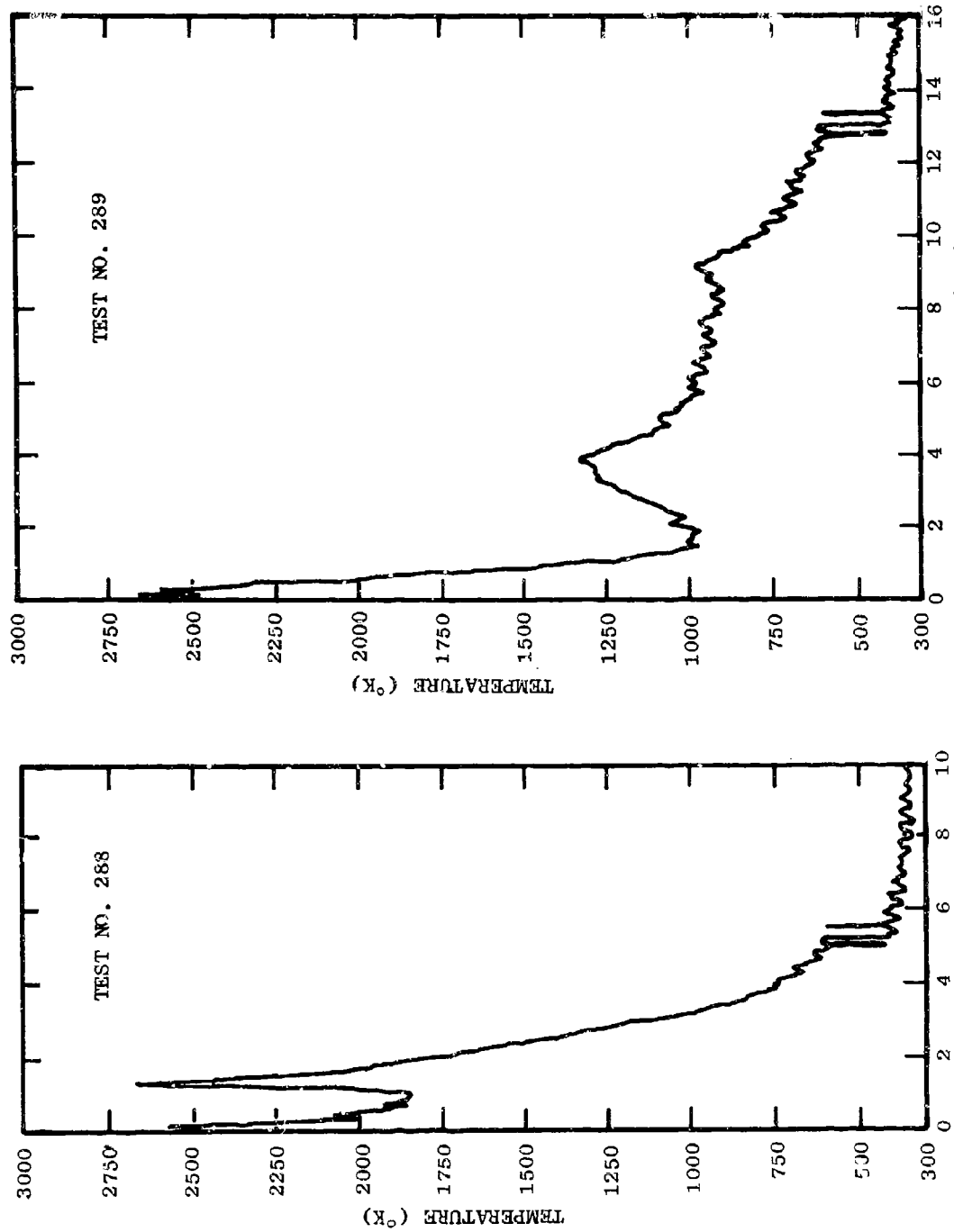

Fig. 2-42. Temperature of Thermocouple Probes for Tests 288 and 289

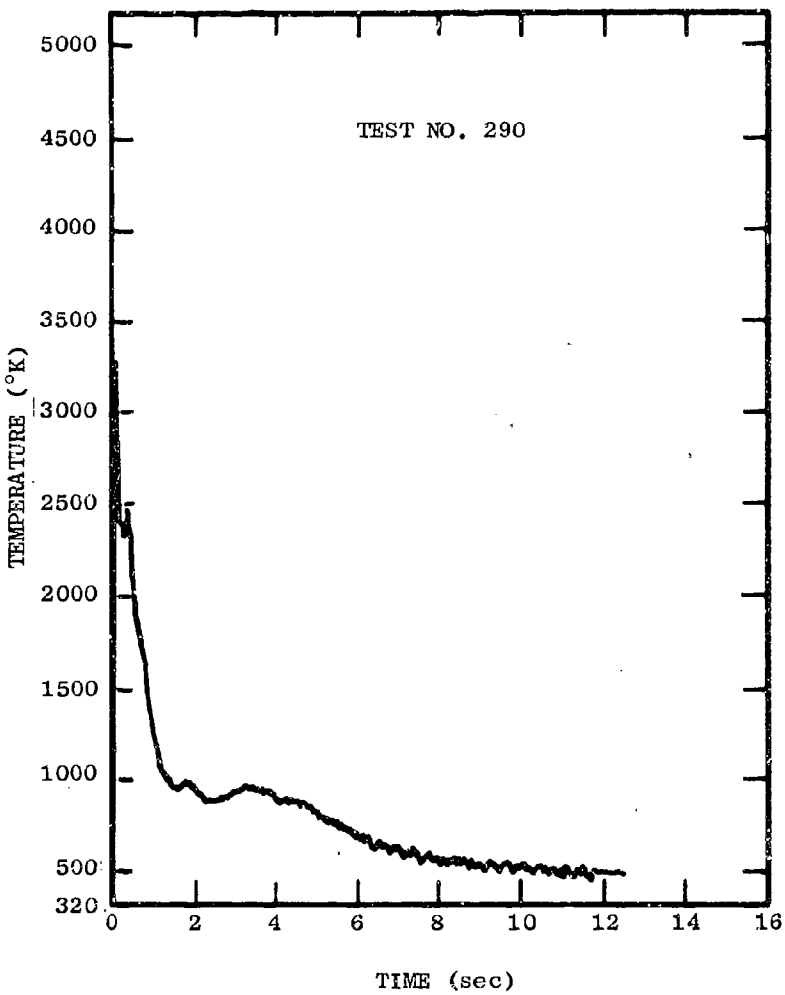

Fig. 2-43. Temperature of Thermocouple Probe for Test 290

Section 3

S-IV FRAGMENTATION DATA

Section 3
S-IV FRAGMENTATION DATA

A controlled failure test of a full-scale Saturn S-IV stage without engine, loaded with approximately 91,200 lb of LO_2/LH_2, was conducted during this program. The objective of this test was to obtain a full-scale data point regarding the blast and thermal hazards of the LO_2/LH_2 propellant combination. Failure was induced by rapidly removing an 18-in.-diameter plug from the intertank bulkhead with a cutter ram.

A detailed discussion of the test objective, a detailed description of the apparatus used to create the desired failure mode, and the blast and thermal results from this test are given in Vol. I.

Following this test, a complete fragmentation survey was conducted of the test area. This survey included locating, measuring, weighing, and describing each fragment from the S-IV vehicle weighing over 1 lb. The area covered was from 100 ft from ground zero to the outer limit of the fragment dispersion, which was approximately 900 ft.

The procedure used for this survey was to lay out on the ground surface a system of 16 radial lines marked off in 100-ft increments, thus dividing the area into 128 easily defined areas. Teams of URS and AFRPL personnel then searched each of these areas, and as each fragment was collected, its approximate location within the area was noted on a map and an identification number written on the fragment. The fragments were then loaded on a truck for transportation to a central point for weighing and measuring.

The data from this survey are presented in Figs. 3-1 through 3-4 and in Table 3-1. Each of these figures presents one-fourth of the total area, with the numbering system starting at the 11 o'clock instrumented leg (the leg oriented toward the blockhouse). Each fragment is shown on these figures with an identification number and a dot representing the approximate location.

Table 3-1 presents the pertinent data for each fragment.

In addition to this survey, nine selected areas near each of the three instrumentation legs were surveyed for all fragments over 1 $in.^2$. These areas were 50 ft square and were located at 200, 400, and 600 ft from ground zero. The data from this survey are presented in Table 3-2. All identified fragments over 1 lb which were found in these areas have also been included in this table.

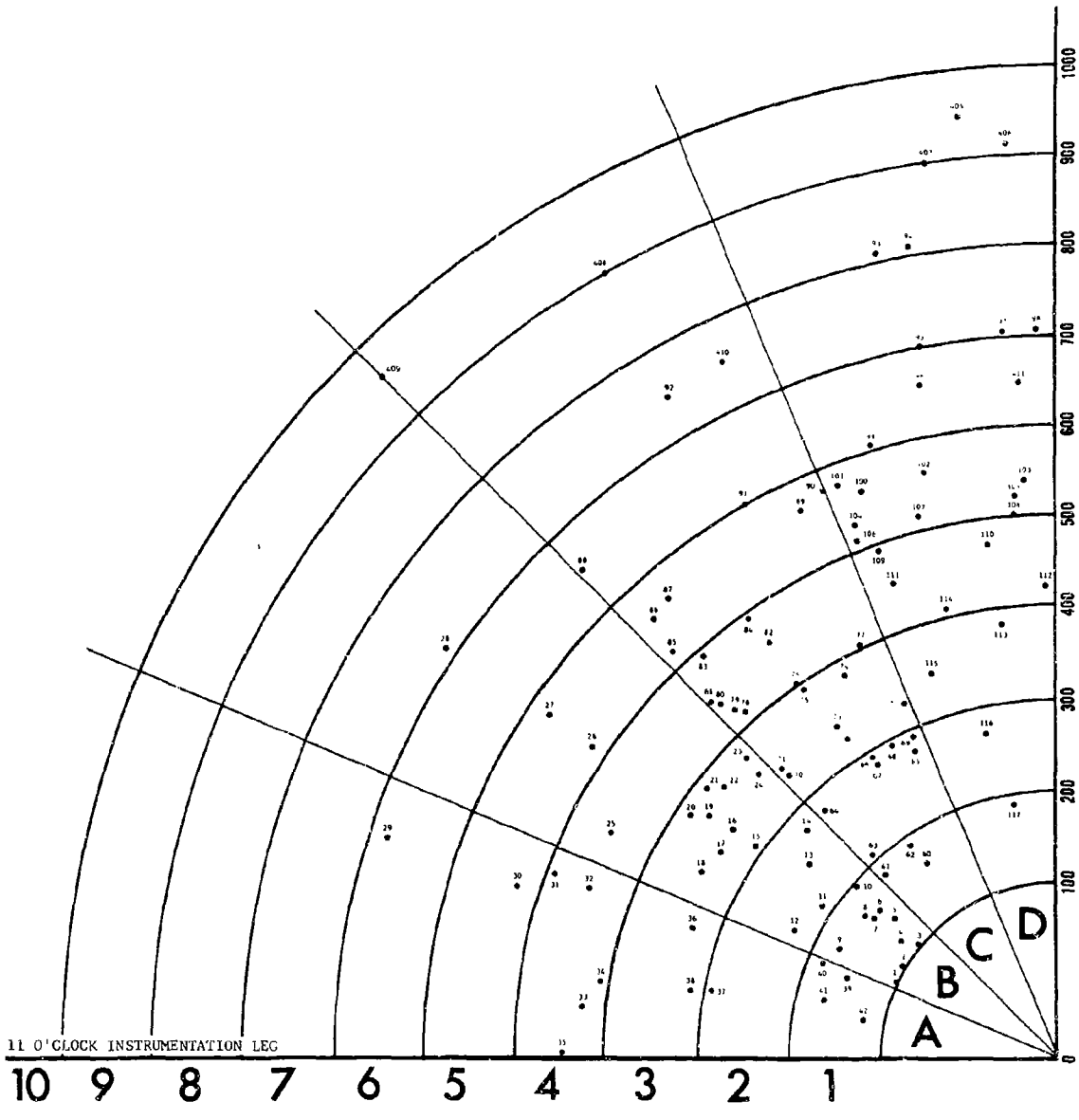

Fig. 3-1. S-IV Fragment Locations (Quadrant I)

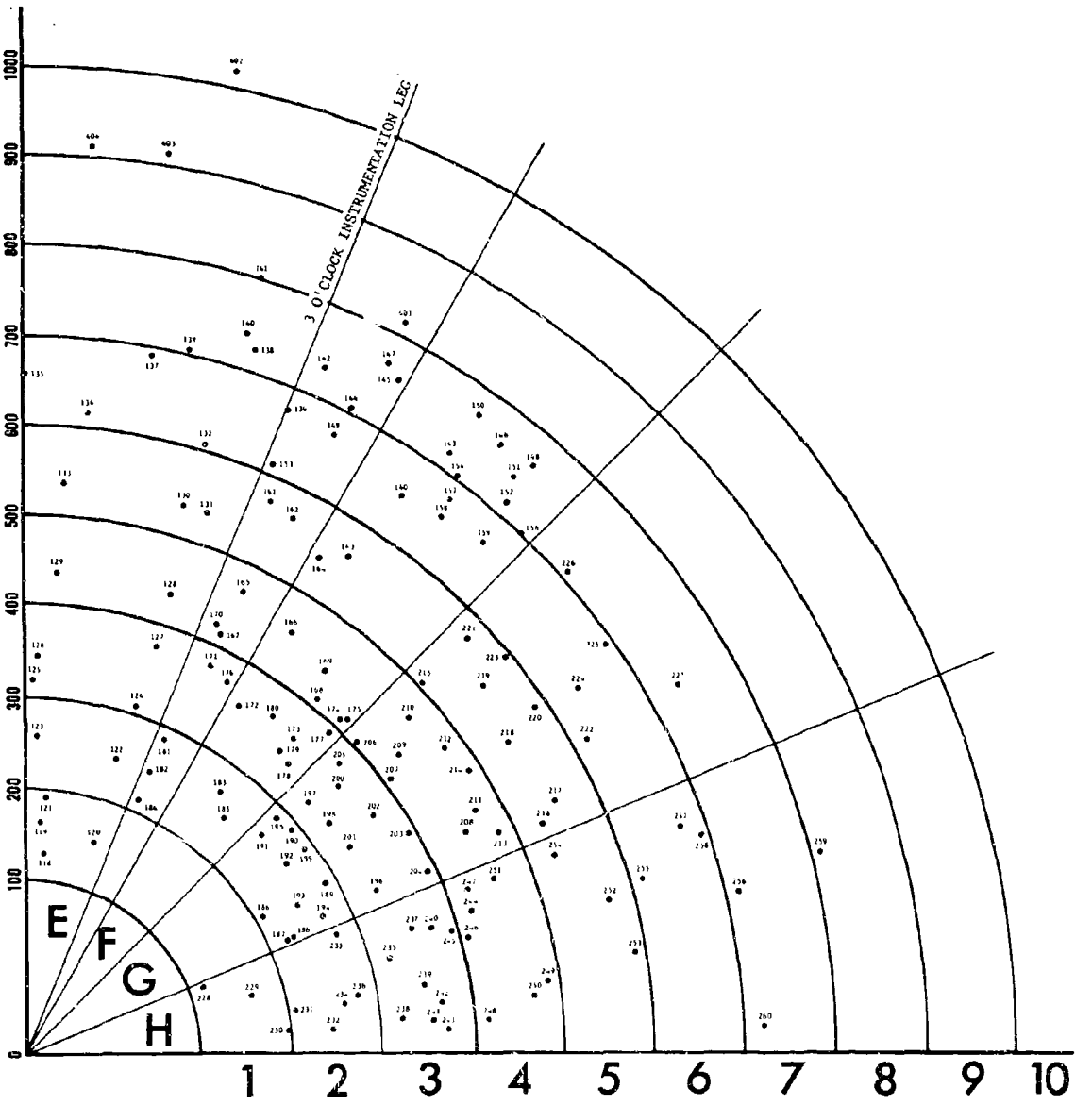

Fig. 3-2. S-IV Fragment Locations (Quadrant II)

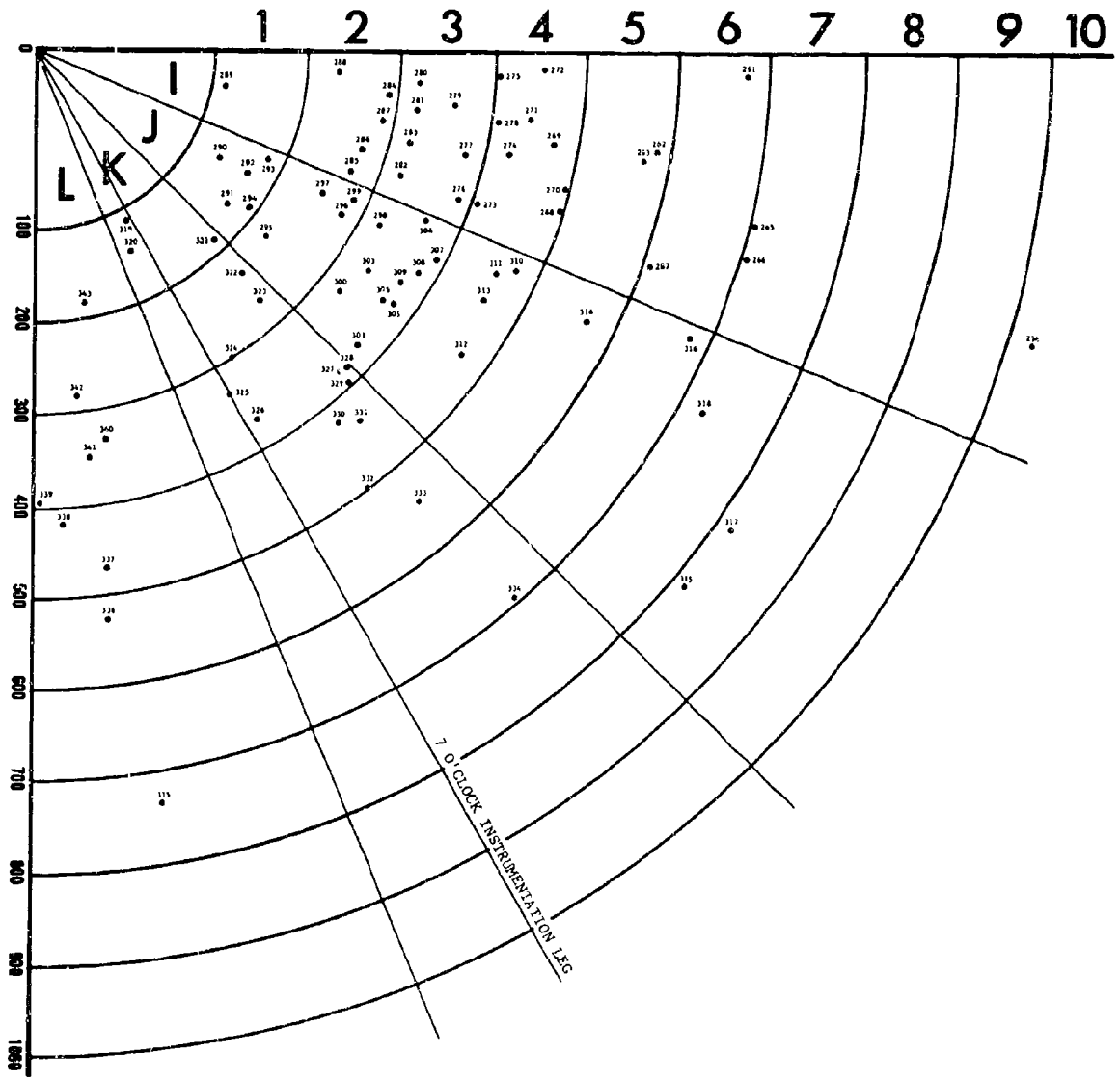

Fig. 3-3. S-IV Fragment Locations (Quadrant III)

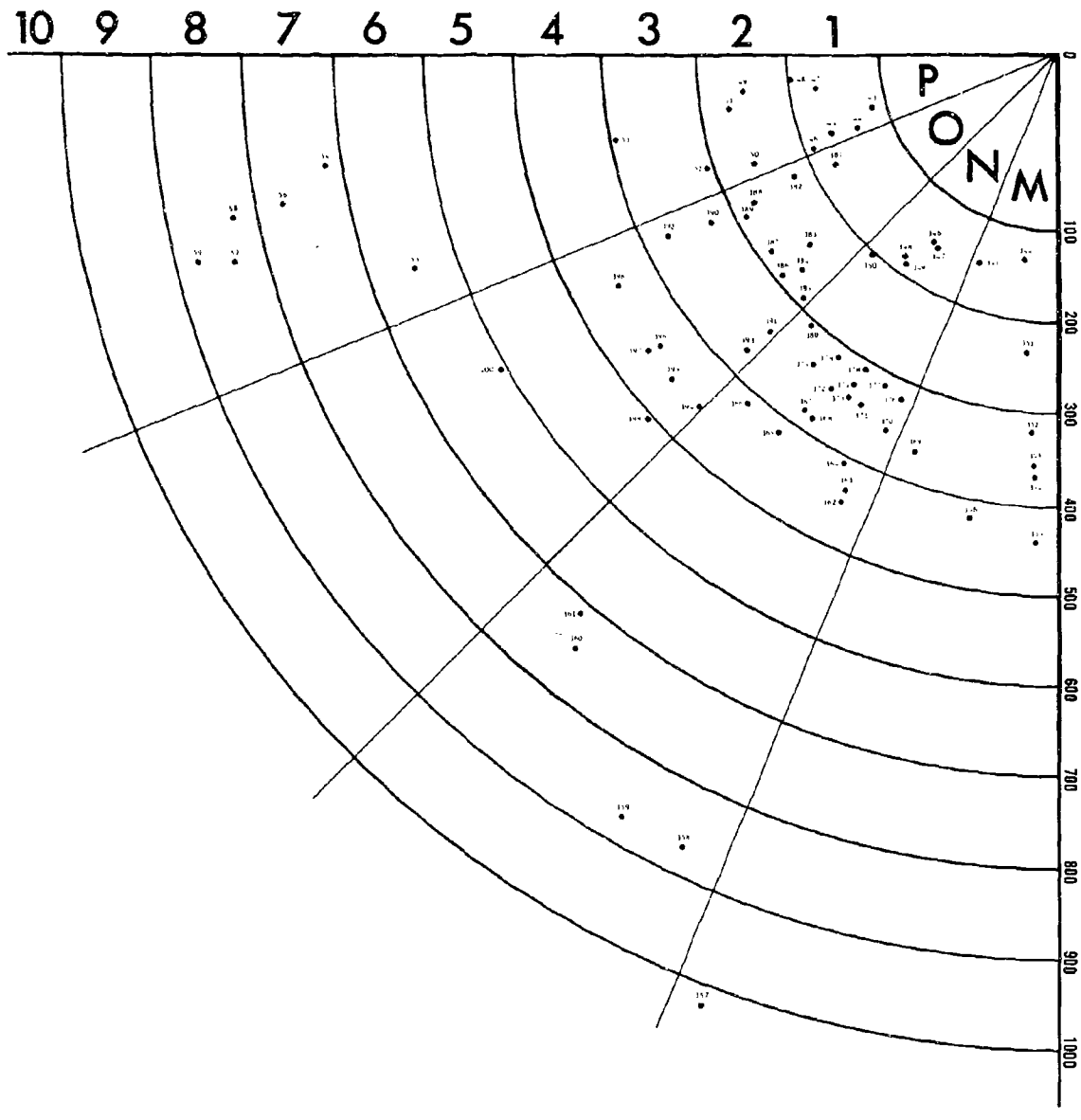

Fig. 3-4. S-IV Fragment Locations (Quadrant IV)

Table 3-1

S-IV FRAGMENTATION DATA

Part 1, Quadrant I

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
A-1	39	30	96 x 60	Aluminum support ring fragment
	40	8	27 x 19	Catwalk grating
	41	4	34 x 9	1/4-in. aluminum honecomb and seam
	42	16	12 x 12 x 1/2	1/2-in.-thick steel plate (dummy hardware)
A-2	37	5	20 x 14	1/4-in. aluminum honeycomb
A-3	36	9	19 x 30	Tank structure 3-in. waffle pattern
	38	3	20 x 14	1/16-in.-thick aluminum sheet
A-4	31	4	18 x 24	Tank structure 7-in. waffle pattern
	32	6	17 x 18	Tank structure 7-in. and 3-in. waffle pattern with seam
	33	6	15 x 19	1/8-in.-thick aluminum sheet
	34	10	24 x 36	Tank structure 7-in. waffle pattern
	35	28	66 x 60	Tank structure 7-in. waffle pattern
A-5	30	6	48 x 34	Junction between two sizes of honeycomb
A-6	29	6	7 x 27	Tank structure seam between 3-in. and 7-in. waffle pattern
B-1	1	2 pcs. 8 lb ea.	30 x 20 and 60 x 15	Two pieces 1/16-in.-thick aluminum sheet
	2	2	7 x 40	1/8-in.-thick aluminum sheet
	3	7	36 x 18	1/8-in.-thick aluminum sheet with seam
	4	12	10 x 6 x 6-1/2	Electronic box
	5	16	8 x 8 x 10	Triangular shaped piece aluminum support structure
	6	32	9 x 10	2-5/8-in.-thick steel plates (dummy hardware)
	7	3	12 x 16	1/8-in.-thick aluminum sheet
	8	29	18 x 11 x 6	Electronic box
	9	2.5	3 x 28 x 1/4	Aluminum angle shape

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
	10	1	18 x 9	1/4-in. honeycomb and seam
B-2	11	17	84 x 24	Aluminum bulkhead
	12	3	5 x 24	1/8-in.-thick aluminum sheet - bent
	13	2	5 x 13	1/8-in.-thick aluminum sheet
	14	3	14 x 5 x 1/16	Transducer and mount fastened to a 4-1/2- by 3- by 1/2-in. steel plate
B-3	15	8	33 x 23	Tank structure 7-in. waffle pattern
	16	8	48 x 18	Tank structure 3-in. waffle pattern with seam
	17	3	14 x 24	Tank structure 7-in. waffle pattern
	18	1 ea.@ 1 lb	8 x 18	1/8-in.-thick aluminum sheet
		1 ea.@ 9 lb	16 x 42 x 1/8	Support frame base
	19	19	48 x 48	Seam and 3-in. waffle
	20	5	20 x 30	Tank structure 7-in. waffle pattern
	21	12	36 x 24	Tank structure 7-in. waffle pattern
	22	8	27 x 30	Tank structure 7-in. waffle pattern
	23	13	26 x 45	Tank structure 7-in. waffle pattern
	24	3	12 x 18	Tank structure 7-in. waffle pattern
B-4	25	6	24 x 18	Tank structure 7-in. waffle pattern
B-5	26	6	24 x 20	Tank structure 3-in. waffle pattern
	27	2	18 x 16	1/8-in.-thick aluminum base plate
B-7	28	2	16 x 11	Tank structure 3-in. waffle pattern and seam
C-1	60	2	12 x 3 x 1/4	Tank structure "T" joint section
	61	2	32 x 1-1/2 x 8	Aluminum angle
	62	7	14 x 39	Tank structure seam between 3-in. and 7-in. waffle pattern
C-2	63	1	15 x 5	1/16-in. aluminum sheet
	64	4	43 x 21	Honeycomb with 1/16-in. walls
	65	2	14 x 13	1/8-in. aluminum sheet - bent
	66	1.5	10 x 6	1/4-in. aluminum sheet
	67	2	14 x 12	Tank structure 3-in. waffle pattern

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
	68	1	4 in. dia.	Blind flange
	69	7	42 x 20	Tank structure 7-in. waffle pattern
C-3	70	2	18 x 6	Aluminum grate
	71	5	28 x 11	Catwalk grating
	72	2	12 x 16	1/8-in. aluminum sheet
	73	2	24 x 16	Common bulkhead panel
	74	3	23 x 14	1/8-in. aluminum sheet
	75	7	33 x 19	Tank structure 7-in. waffle pattern
C-4	76	8	40 x 20	Tank structure 3-in. waffle pattern
	77	10.5	30 x 30	Tank structure 7-in. waffle pattern
	78	3	18 x 12	Tank structure 3-in. waffle pattern
	79	7	36 x 18	Tank structure 7-in. waffle pattern
	80	1	16 x 6	1/8-in. aluminum sheet
	81	16	50 x 43	Tank structure 7-in. waffle pattern
	82	8	59 x 6 x 1/4	Aluminum support ring
	83	2	42 x 19	Aluminum honeycomb
	84	3	19 x 6	1/4-in. aluminum sheet
C-5	85	2	19 x 12	Aluminum honeycomb with 1/4-in. joint
	86	2	18 x 12	1/16-in. aluminum sheet
	87	19	48 x 36	3-in. waffle - seam - 7 in. waffle
	89	6	18 x 18	1/8-in. aluminum sheet - bent
	90	15	37 x 18	Aluminum honeycomb with 1/16 in. walls
C-6	88	6	21 x 6 x 1/4	"T" joint
	91	2	24 x 20	Triangle shaped LH_2 tank wall section
C-7	92	8	10 x 5 x 1/2	Steel plate (dummy hardware)
	410	4	9 x 3.5 x 5/8	Steel plate (dummy hardware)
C-9	408	8	10 x 5 x 1/2	Steel plate (dummy hardware)
	409	5	22 x 20	Tank structure 3-in. waffle pattern
D-1	117	11	72 x 23 x 1/16	Aluminum sheet

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
D-2	116	4	32 x 12 x 1/16	Common bulkhead
D-3	115	35	96 x 84 x 3/8	Aluminum support ring fragment
	113	3	65 x 6 x 1/16	Aluminum support structure rib
D-4	109	4	22 x 22	Tank structure 3-in. waffle pattern
	110	7	24 x 20	Tank structure 7-in. waffle pattern
	111	7.5	39 x 18	1/8-in. aluminum sheet - bent
	112	3	22 x 10 x 1/8	Common bulkhead with seam
	114	3	18 x 4 x 1/4	"T" shape aluminum sheet
D-5	100	29	30 x 30 x 30	Tangled mass aluminum with some small steel plates attached
	101	9	36 x 11 x 1/4	LH_2 manhole
	102	2	21 x 14	LH_2 dome
	103	4	9 x 3.5 x 5/8	Steel Plate (dummy hardware)
	104	6.5	6 x 4 x 1/4	Steel plate
	105	5	25 x 15	1/8-in. aluminum sheet
	106	2.5	15 x 10	Aluminum honeycomb
	107	5	24 x 12	Tank structure 3-in. waffle pattern and seam
	108	4	24 x 18	Tank structure 7-in. waffle pattern
D-6	96	6	36 x 6	Tank structure 3-in. and 7-in. waffle pattern with seam
	99	5.5	18 x 12	Aluminum honeycomb and seam
	411	4	9 x 3.5 x 5/8	Steel plate (dummy hardware)
D-7	95	1	8 x 7	Tank structure 7-in. waffle pattern
	97	16	12 x 12 x 1/2	Steel plate (dummy hardware)
	98	4.5	9.5 x 4.5 x 5/8	Steel plate (dummy hardware)
D-8	93	15	40 x 36	Tank structure 3-in. waffle pattern
	94	8	24 x 18	Aluminum support structure
	407	3	13 x 10	Tank structure 3-in. waffle pattern with seam
D-9	406	2.5	5 x 3	Steel plate (dummy hardware)
	405	3.5	5 x 3 x 1/2	Steel plate (dummy hardware)

Table 3-1, cont.

Part 2, Quadrant II

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
E-1	118	17.5	12 x 12	Aluminum support ring
	119	6	48 x 48	Aluminum angle
	120	7	16 x 8 x 1/4	Aluminum support ring fragment
	121	2	20 x 8	1/16-in. aluminum sheet
E-2	122	32.5	96 x 8 x 3/8	Aluminum support ring fragment
	123	9	12 x 12	Heavy aluminum seam
E-3	124	6	34 x 18	1/8-in. aluminum sheet - bent
	125	2	12 x 16	1/8-in. aluminum with seam
	126	2	16 x 16	1/8-in. aluminum sheet
	127	6	30 x 20	Tank structure 3-in. waffle pattern
E-4	128	2	24 x 8	"T" joint
	129	25	46 x 46	Tank structure 7-in. waffle pattern
E-5	130	7	30 x 20	Aluminum sheet
	131	4.5	22 x 20	Tank structure 7-in. waffle pattern
	133	4	9 x 5 x 1/2	Steel plate Ser. No. A20847-521NC
E-6	132	9	36 x 30	Tank structure 7-in. waffle pattern
	134	2	60	PU probe
	135	1.5	2 in. dia. by 6 in. long	PU probe - top end
	136	10	36 x 24	Tank structure 7-in. waffle pattern
	137	2	18 x 12	Tank structure 7-in. waffle pattern
E-7	138	17	48 x 36	Tank structure 7-in. waffle pattern
	139	3	1-in. strap	Stainless steel bellows holder
	140	5	22 x 16	Tank structure 7-in. waffle pattern
E-8	141	10	36 x 20	Tank structure 7-in. waffle pattern
E-9	403	1.5	14 x 14	Tank structure 7-in. waffle pattern

Table 3-1. cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
	404	9	54 x 48	Tank structure 7-in. waffle pattern
F-1	402	2	18 x 14	Aluminum honeycomb
F-2	181	2	50 x 4	1/16-in. aluminum sheet - bent
	182	4	20 x 12	1/8-in. aluminum sheet - bent
	183	7.5	60 x 18	Aluminum honeycomb
	184	14	7 x 9 x 7	Triangle shaped support structure
	185	4	3/8	Aluminum - section of footing
F-3	171	2	24 x 16	1/16-in. aluminum sheet
	172	5	36 x 12	Aluminum honeycomb
	173	5	24 x 20	Tank structure 7-in. waffle pattern
	176	2	15 x 6	1/8-in. aluminum sheet bent and twisted
	177	5	36 x 18 x 1/8	Tank structure 7-in. waffle pattern
	178	21		Catwalk structure
	179	23	2 x 2 channel 72 long	Ring - thrust chamber mount
	180	3	24 x 12	Aluminum honeycomb
F-4	165	3	16 x 12	1/8-in. aluminum sheet
	166	5	38 x 6	5/8-in. aluminum sheet
	167	2	21 x 15	Tank structure 3-in. waffle pattern
	168	13	18 x 3	Riveted joint
	169	3	20 x 10	Tank structure 7-in. waffle pattern
	170	11	72 x 10	Aluminum honeycomb
	174	3	24 x 18	1-in. aluminum honeycomb
	175	1	4 in. dia.	Pipe fitting clamp
F-5	161	7	31 x 17	Catwalk grate
	162	7		LH_2 fill - quick disconnect - male
	163	2	14 x 11	Tank structure 7-in. waffle pattern
	164	3	14 x 12	1/8-in. aluminum sheet
F-6	153	14	48 x 36	Tank structure 7-in. waffle pattern
	149	8	9.5 x 5.5 x 1/2	Steel plate (dummy hardware)
	157	9	32 x 18	Catwalk structure
	158	5.5	24 x 17	Tank structure 3-in. waffle pattern

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
	9	1	3 16	Aluminum joint
		6	24 x 18	Aluminum honeycomb
F-7	142	16	12 x 12 x 1/2	Steel plate (dummy hardware)
	143	6	28 x 6	Seam between waffles
	144	11	84 x 5	1 4-in. aluminum sheet
	145	8	20 x 18	Seam with 1 4-in. honeycomb
	146	5	20 x 18	Tank structure 3-in. waffle pattern
	147	2	12 x 8	Tank structure 3-in. waffle pattern with seam
	148	19	57 x 31	Tank structure 3-in. waffle pattern
	150	9	14 x 14	12 bolt flange
	151	5.5	24 x 4	Aluminum piece with 3- by 5-1/2 by 1/2-in. steel plate attached
	152	5	15 x 12 x 1/4	Aluminum honeycomb
	154	9	24 x 20	Tank structure 3-in. and 7-in. waffle pattern with seam
	156	1	12 x 12	1 8-in. aluminum sheet
F-8	401	6	2 in. dia.	LH_2 probe
G-2	190	6	48 x 18 x 1/16	Tank structure 7-in. waffle pattern
	191	9	48 x 24 x 1/16	Aluminum bulkhead
	192	4	19 x 11	1 8-in. aluminum sheet
	193	1	12 x 10	Catwalk member
	194	1.5	18 x 10 x 1/8	Tank seam
	199	1	48 x 8	1 16-in. aluminum sheet
	195	36	90 x 8	Aluminum - support ring
	189	3.5	24 x 11	Catwalk
	186	5	36 x 3 x 1/4	Aluminum angle
	187	6	60 x 2	Catwalk structure
	188	7	18 x 18	1 8-in. aluminum sheet
G-3	196	4	17 x 6 x 1/4	Aluminum angle
	197	2	13 x 8	3 8-in. aluminum sheet
	198	2	48 x 8	1 16-in. aluminum sheet
	200	11.5		Catwalk structure

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
	201	8	54 x 29	1 16-in. aluminum sheet
	202	3	48 x 16	1 16-in. aluminum sheet
	203	10	2 x 2 channel 48 long	Catwalk leg
	204	5	24 x 21	Tank structure 7-in. waffle pattern
	205	1	19 x 9	1 16-in. aluminum sheet
G-4	206	10.5	42 x 16	Catwalk grating
	207	9	44 x 27 x 1 16	Tank structure 3-in. waffle pattern and aluminum sheet
	208	3	16 x 12	1 8-in. aluminum sheet
	209	1	14 x 14	1 8-in. aluminum sheet
	210	7	44 x 14	Aluminum honeycomb with skin
	211	2	16 x 16	1 8-in. aluminum sheet
	212	2.5	18 x 15	1 8-in. aluminum sheet
	213	20	2 x 2 channel 96 long	Lift ring structure
	214	22	48 x 48	Tank structure 7-in. waffle pattern
G-5	215	19	14 length 9 dia.	LH_2 vent
	216	17	48 x 36	Tank structure 3-in. waffle pattern with seam
	217	6	26 x 24	Tank structure 7-in. waffle pattern
	218	7	30 x 24	Tank structure 7-in. waffle pattern
	219	6	20 x 14	Tank structure 3-in. waffle pattern
	220	7	38 x 18	Aluminum sheet
	221	16	24 dia.	1 2 circle LH_2 tank manhole flange
	223	5	23 x 16	Aluminum sheet
G-6	222	9	34 x 34	Tank structure 7-in. waffle pattern
	224	15	31 x 24	Tank structure 3-in. waffle pattern - seam - noneycomb
	225	7	22 x 12	LH_2 access with honeycomb
G-7	226	9	36 x 12 x 1/8	Access plate
	227	9	37 x 15	Catwalk grating

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
H-1	228	16		Portion of aluminum support ring
	229	88	120, 2 x 2 channel	Catwalk frame work with legs
	230	10	52, 2 x 2 channel	Catwalk support
H-2	231	2	18 x 7	1/8-in. aluminum sheet
	232	2	15 x 10	Top LH_2 manhole
	233	1	16 x 2.5 x 2.5 angle	1/4-in. aluminum
	234	2.5	19 x 16	1/8-in. aluminum sheet
	236	3.5	43 x 28	Honeycomb, skin and seam
H-3	235	9	34 x 17	1/8-in. aluminum sheet with sta-foam
	237	1	16 x 8	1/8-in. aluminum sheet
	238	2	31 x 6	Catwalk grating
	239	9	60 x 8	Aluminum honeycomb
	240	3	14 x 14	Tank structure 7-in. waffle pattern
	241	1	16 x 12	1/8-in. aluminum sheet
	242	2	20 x 7	1/8-in. aluminum sheet
	245	2	17 x 3 x 3/8	"T" Bar
	243	6.5	43 x 6	1/4-in. aluminum sheet
H-4	244	5	33 x 12	Tank structure 7-in. waffle pattern
	246	1	16 x 8	1/8-in. aluminum sheet
	247	3	24 x 12	Tank structure 7-in. waffle pattern
	248	2	12 x 12	Tank structure 3-in. waffle pattern with seam
	249	5	8.5 dia.	Blind pipe flange
	250	1.5	36 x 22	Tank structure 3-in. waffle pattern with joint
	251	1	8 x 4 x 5/16	Aluminum - support structure
H-5	252	9	36 x 14	Aluminum honeycomb
	253	27	72 x 48	Tank structure 7-in. waffle pattern
	254	1	16 x 6	1/8-in. aluminum sheet
H-6	255	7	48 x 6	1/4-in. aluminum with rivets
	257	2	24 x 6	Aluminum seam
	258	3	12 x 10	1/8-in. aluminum sheet

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
H-7	256	15	40 x 36	Tank structure 7-in. waffle pattern
	260	6	29 x 5	Tank structure 3-in. waffle pattern and seam
H-8	259	10	39 x 18	Aluminum honeycomb with skin

Table 1, cont.

Part 3, Quadrant III

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
I-1	289	16		Triangle-shaped aluminum support structure
I-2	284	6	26 x 14	Tank structure 7-in. waffle pattern
	285	3	84 x 6	1/16-in. aluminum sheet
	286	6		LOX fill collar and flex hose
	287	4	2-1/2 in. dia.	Stainless LH_2 fill line
	288	6	19 x 14	1/8-in. aluminum sheet
I-3	276	2	16 x 16	1/8-in. aluminum sheet
	277	2	16 x 16	1/8-in. aluminum sheet
	279	4	21 x 17	1/8-in. aluminum plate - bent
	280	2	24 x 18	1-in. aluminum honeycomb
	281	3	42 x 2 x 1/2	Angle - thrust structure
	282	5	59 x 9.5	Honeycomb
	283	3	43 x 22	Honeycomb
I-4	268	13	48 x 30	Tank structure 7-in. waffle pattern
	269	4.5	27 x 6 x 1/4	Aluminum sheet - bent
	270	3	18 x 12	Aluminum joint
	271	13	40 x 36	Tank structure 3-in. waffle pattern
	272	7	30 x 12	Tank structure 3-in. waffle pattern
	273	12	48 x 36	Access door and 1-in. aluminum honeycomb
	274	4	24 x 10 x 1/8	Aluminum sheet with 1-1/2-in. angle fastened
	275	8	32 x 21	Tank structure 7-in. waffle pattern
	278	16	74 x 26	Tank structure 7-in. waffle pattern
I-5	262	14	45 x 28	Tank structure 7-in. waffle pattern
	263	4	20 x 12	Tank structure 3-in. waffle pattern
I-6	261	8.5	33 x 16	Aluminum honeycomb with skins
	267	8	36 x 26	Tank structure 7-in. waffle pattern
I-7	265	7.5	12 x 10 x 8	LH_2 quick disconnect housing
	266	5	24 x 12	Tank structure 3-in. waffle pattern

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (*lb*)	DIMENSION (*in.*)	DESCRIPTION
I-10	264	7	108 x 6	Aluminum seam with waffle
J-1	290	9		Half of LH_2 manhole
	291	8	24 x 15 x 1/8	Aluminum seam
	292	28	90 x 8 x 3/8	Support ring piece
	293	21	18 ft. dia.	"T" joint on dia. of 2 tanks
	294	2	29 x 6 x 1/16	Rib sheet - aluminum
J-2	295	3	16 x 6	1/8-in. aluminum sheet - bent
	296	4.5	24 x 12	Tank structure 3-in. waffle pattern with joint
	297	3.5	27 x 4	"T" joint structure
	299	1	10 x 3	Aluminum joint
J-3	298	9	44 x 36	Aluminum sheet
	300	7.5	36 x 14	Tank structure 7-in. waffle pattern
	301	17	36 x 36	Tank structure 3-in. with seam
	303	9	20 x 16 x 1/8	Aluminum riveted seams
	304	16	48 x 36	Tank structure 7-in. waffle pattern
	305	12	84 x 6	1/4-in. aluminum sheet
	306	17	18 dia. 18 long	Cutter ram head
	307	7	24 x 12	1-in. honeycomb - access door
	308	12	40 x 36	Tank structure 7-in. waffle pattern
	309	7	15 x 4	Tank structure 7-in. waffle pattern
J-4	310	11	36 x 36	Tank structure 7-in. waffle pattern
	311	3	22 x 16	Tank structure 3-in. waffle pattern
	312	2	24 x 14	Tank structure 7-in. waffle pattern
	313	3	36 x 3 x 1/4	Aluminum seam
J-5	314	12	30 x 24	Tank structure 3-in. waffle pattern with seam
J-6	316	9	30 x 24	Tank structure 3-in. waffle pattern with seam
J-7	318	6	18 x 16	Tank structure 3-in. waffle pattern with seam

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
J-8	315	8	48 x 4.5 x 3.8	Aluminum seam
	317	9	36 x 36	Tank structure 7-in. waffle pattern
K-1	319	6	72 x 8	1/8-in. aluminum sheet
	320	36	96 x 84 x 3.8	Support ring structure
	321	4	20 x 12 x 1.8	Aluminum seam
K-2	322	8	26 x 14	1/8-in. aluminum sheet
	323	4	24 x 16	1 8-in. aluminum sheet
	324	22	60 x 32	Aluminum honeycomb
K-3	325	2.5	20 x 12	1/8-in. aluminum sheet
	326	31	54 x 35	Tank structure 3-in. waffle pattern
	327	3	24 x 16	1/8-in. aluminum sheet
	328	7	34 x 24	Tank structure 7-in. waffle pattern
	329	5	24 x 12	Tank structure 7-in. waffle pattern
K-4	330	10	27 x 25	Tank structure 3-in. waffle and 7-in. waffle pattern and seam
	331	8	24 x 24	Tank structure 3-in. waffle pattern
K-5	332	11	36 x 22	1/4-in. aluminum honeycomb sandwich
	333	17	40 x 35	Tank structure 7-in. waffle pattern
K-6	334	9	38 x 5	1/4-in. aluminum sheet
L-1	343	16		Triangular footing from support ring
L-2	342	5	24 x 20	Tank structure 7-in. waffle pattern
L-3	339	7.5	28 x 26	Tank structure 7-in. waffle pattern
	340	7.5	32 x 18	1/2-in. aluminum sheet
	341	13	48 x 36	Tank structure 7-in. waffle pattern
L-4	337	5	27 x 16	1/8-in. aluminum sheet
	338	6	6 dia.	LH_2 vent connection

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
L-5	[illegible]	11	36 x 24	Tank structure 3-in. waffle pattern and seam
		7	24 [illegible] x [illegible]	Aluminum seam

Table 3-1, cont.

Part 4, Quadrant IV

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
M-1	344	6	30 x 18	Catwalk grating
	345	4.5	15 x 6 x 3/8	Support ring structure
M-2	351	8	35 x 20	Tank structure 7-in. waffle pattern
M-3	352	11	40 x 14	1/8-in. aluminum sheet
	353	4	29 x 20	Tank structure 7-in. waffle pattern
	354	11	84 x 6	1/4-in. aluminum sheet
	369	11	34 x 24	Tank structure 3-in. waffle and 7-in. waffle pattern
M-4	355	4	20 x 7	Aluminum honeycomb
	356	5		Cutter ram outer ring - stainless steel
M-10	357	8	27 x 24	Tank structure 7-in. waffle pattern
N-1	346	6	20 x 18	1/8-in. aluminum sheet
	347	6	34 x 17	Catwalk grate
	348	16	48 x 36 x 1/16	Aluminum skin
	349	7	36 x 10 x 1/8	Aluminum seam
N-2	350	17	8 x 8 x 10	Traingle section from aluminum support ring
N-3	368	2.5	19 x 3 x 3/8	"T" Bar
	367	4	35 x 3 x 1/4	Angle shape
	370	5	24 x 18	Tank structure 3-in. waffle pattern
	376	9	35 x 12 x 1/8	Access plate
	371	29	96 x 7	3/8-in. aluminum seam
	372	2	14 x 10	1/8-in. aluminum sheet
	373	1	14 x 3	1/4-in. aluminum sheet
	374	7	44 x 4	1/16-in. aluminum sheet
	375	5	24 x 14	1/8-in. aluminum sheet
	378	1.5	12 x 8	1/8-in. aluminum sheet
	379	1	16 x 6	1/8-in. aluminum sheet
	380	1	16 x 5	1/8-in. aluminum sheet
	377	2	13 x 11	1/8-in. aluminum sheet

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
N-1	362	2.5	17 x 15	1/8-in. aluminum sheet
	363	3	12 x 7	Support ring
	364	1	12 x 3	Aluminum seam
	365	3	25 x 6 x 1/4	Aluminum support ring structure
	366	3	19 x 12	Tank structure 3-in. waffle pattern
N-7	360	7.5	19 x 15	Aluminum honeycomb sandwich
	361	2.5	18 x 14	Tank structure 7-in. waffle pattern
N-8	358	3	16 x 15	Tank structure 3-in. waffle pattern
	359	15	84 x 5	Tank structure 7-in. waffle pattern
O-1	381	3	23 x 6 x 1/8 and 49 x 2 x 1/8	Aluminum seams
O-2	382	8	10 x 2 x 2	Sandia battery box
	383	3	26 x 3 x 1/4	Aluminum seam
	384	4	30 x 18	1/8-in. aluminum sheet
	385	9	38 x 25	Tank structure 7-in. waffle pattern
	386	22	60 x 8	Aluminum support ring
	387	1	16 x 8	1/8-in. aluminum sheet
	388	2	17 x 8	1/8-in. aluminum sheet
	389	1	14 x 5	1/8-in. aluminum sheet
O-3	390	2	20 x 13	Tank structure 7-in. waffle pattern
	391	3	15 x 4	1/8-in. aluminum sheet
	392	3	26 x 6	1/4-in. aluminum sheet
	393	3	14 x 7	1/8-in. aluminum sheet
O-4	394	26	56 x 32	Tank structure 3-in. waffle pattern
	395	6	37 x 14	Tank structure 3-in. waffle pattern
	396	6	48 x 6	1/4-in. aluminum riveted seam
	397	3	18 x 6	1/4-in. aluminum sheet
	398	10	34 x 13	Tank structure 3-in. waffle pattern with seam

Table 3-1, cont.

SUBSECTOR	NUMBER	WEIGHT (lb)	DIMENSION (in.)	DESCRIPTION
O-5	399	33	60 x 60	Tank structure 7-in. waffle pattern
O-6	400	3	14 x 10	Tank structure 3-in. waffle pattern
P-1	43	6	12 x 6 x 1/4	Aluminum suppport structure
	44	9	72 x 20	Aluminum honeycomb
	45	1.5	30 x 6	1/8-in. aluminum sheet - support structure
	46	12	60 x 30	Common bulkhead
	47	9	24 x 18	1/8-in. aluminum sheet
	48	10	38 x 26	Tank structure 7-in. waffle pattern
P-2	50	4	24 x 20	1/8-in. aluminum sheet
	51	8	33 x 17 x 1/8	Support structure
	49	7	28 x 18	1/8-in. aluminum sheet
P-3	52	12	40 x 20	Tank structure 7-in. waffle pattern
	53	6.5	20 x 18	Aluminum sheet
P-6	55	5	24 x 20	Tank structure 3-in. waffle pattern
P-7	54	3	20 x 18	Tank structure 7-in. waffle pattern
	56	10	48 x 16	Tank structure 7-in. waffle pattern
P-8	57	4	19 x 18	Tank structure 3-in. waffle pattern
	58	6	20 x 18	Tank structure 3-in. waffle pattern
	59	8	22 x 20	Aluminum honeycomb