UNCLASSIFIED [redacted]

0636

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
1st Review Date: 8/11/98
Authority: ADD
Name: RBCramer
2nd Review Date: 8/20/98
Authority: ADD
Name: W Layne
Determination (Circle Number):
1. Classification Retained
2. Classification Changed to: U
3. Contains No DOE Classified Information
4. Coordinate With:
5. Contains UCAI?
6. Comments: DECLASSIFY

APR 23 1957
Case No. 690.00
Ref. Sym: 1612 (417)
Project No. TM-481
File: TX-28, 3-2

MR. S. A. MOORE - 1224

Attn: Mr. E. R. Stepka - 1222-2

Re: Static Test of TX-28 Forward Case

Summary of Results

One TX-28 forward case (MC-710) was subjected to four conditions of combined lateral and longitudinal loads simulating retarded fall. The lateral loads simulated combined air and inertia loads. The longitudinal loads simulated inertia loads encountered in retarded fall. Test Condition No. 1 combined lateral loads oriented upward and a longitudinal load simulating inertia skin stresses between stations 26.00 and 40.34. Test Condition No. 2 was identical to Test Condition No. 1 except the lateral loads were oriented to the left to an observer looking aft. Test Condition No. 3 combined lateral loads oriented upward with a longitudinal load simulating inertia skin stresses between stations 40.34 and 52.25. Test Condition No. 4 was identical to Test Condition No. 3 except the lateral loads were oriented to the left for an observer looking aft.

The maximum deflection at 200 per cent limit load was 1.570 inches recorded in Test Condition No. 1, measured in a lateral direction, at a point 2.75 inches from the front of the case. Test Condition No. 4 was conducted to failure with the rivets connecting the case to the mounting ring shearing at 280 per cent design limit load.

Object of Test

The object of this test was to determine various structural properties of the TX-28 forward case when subjected to loads simulating those encountered in parachute retarded fall.

Reason for Test

The test was requested in a Work Order Authorization from Mr. J. H. Davis, 1224-2, to Mr. P. H. Adams, 1612, dated December 13, 1956.

Function of Object Tested

The object tested is the forward section of the TX-28 ballistic case (MC-710).

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APR 2 [illegible] 1957
R & D FILES [redacted]

SANDIA SYSTEMATIC DECLASSIFICATION REVIEW
DOWNGRADING OR DECLASSIFICATION STAMP
CLASSIFICATION CHANGED TO: U
Emelda Selph 8/26/96
PERSON CHANGING MARKING & DATE
W C Layne 8/26/98
PERSON VERIFYING MARKING & DATE
AUTHORITY: W. C. Layne
RECORD ID: 98SN3795
DATED: 8/20/98

CDL No.
ACCOUNTABILITY CARD
FILE No. TX-28
3-2

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Summary of Past Tests

The TX-28 shape was subjected to simulated Douglas Aero 7A ejector loads as reported in a memorandum, Simulated Flight Test of TX-28 Shape with Dynamic Balance, Ref. Sym: 1612 (312), Project No. TM-378, dated April 12, 1956. No indication of yield was observed at 100 per cent design limit load.

The TX-28 front case and fin were subjected to simulated air resistance loads as reported in a memorandum, Static Test of TX-28 (Internally-Carried Version) Front Case and Fin, Ref. Sym: 1612 (316), Project No. TM-382, dated April 18, 1956. Both the case and fin withstood a maximum of 150 per cent design limit load without indication of failure or yield.

The TX-28 front case was subjected to one simulated ejection condition of 200 per cent design limit load and two free fall conditions of 150 per cent design limit load as reported in a memorandum, Static Test of TX-28 Front Case, Ref. Sym: 1612 (355), Project No. TM-421, dated August 15, 1956. The case withstood the test conditions without visible damage. Stresscoat data indicated maximum tensile stresses of approximately 15,000 psi at 150 per cent design limit load for the ejection condition.

The TX-28 front case and fin were subjected to simulated air resistance loads of 150 per cent design limit load as reported in a memorandum, Static Test of TX-28 (Internally-Carried Version) Front Case and Fin, Ref. Sym: 1612 (356), Project No. TM-422, dated August 1, 1956. Local yielding was observed around one mounting bracket in the fin. No evidence of damage to the case was observed.

Setup for Test

I. Figures 1 and 2 are photographs depicting the test setup for test Condition No. 1. The setup for Test Condition No. 2 was identical except the case was rotated 90 degrees about the longitudinal axis (placing the access doors in Fig. 1 on the bottom). Figures 3 through 5 are photographs depicting the test setup for Test Condition No. 3. Test condition No. 4 was identical to No. 3 except the case was rotated 90 degrees as in Condition No. 2. Figures 6 and 7 are sketches defining magnitudes and directions of limit loads.

II. The following component was tested:

One TX-28 forward case (MC-710).

III. The following equipment was used in the test:

1. Three Simplex hydraulic pumps, capacity 8750 psi.

2. Two Blackhawk hydraulic pumps, capacity 10,000 psi.

3. Three Simplex hydraulic rams, capacity 30 tons.

4. Four Simplex hydraulic rams, capacity 60 tons.

5. Pull Bar I, one-inch diameter, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.162.

6. Load Link C, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.092.

7. Load Link E, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.072.

8. Load Link A, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.064.

9. Pull Bar G, one-inch diameter, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.172.

10. Pull Bar F, one-inch diameter, sensitivity 0.1 microinch per inch per pound at a gage factor setting of 2.176.

11. Pull Bar K, one-inch diameter, sensitivity 0.1 microinch per inch at a gage factor setting of 2.132.

12. Pull Bar H, one-inch diameter, sensitivity 0.1 microinch per inch at a gage factor setting of 2.140.

13. Seven Baldwin SR-4 strain indicators, Serial Nos. J-59101, J-59191, 175441, J-92499, 391902, 391903, and 391904.

IV. The following instrumentation was listed in the test:

1. Stresscoat No. 1206.

2. Three Starrett dial indicators, division 0.001 inch, range one inch.

3. Two Ames dial indicators, division 0.001 inch, range three inches.

Procedure

The case was Stresscoated and cantilever mounted as shown in Figs. 1 and 2 (Test Condition No. 1). Orientation and magnitude of limit loads were as depicted in Fig. 6. The lateral loads simulated combined air and

inertia loads. The longitudinal load simulated inertia skin stresses between stations 26.00 and 40.34 and were applied to the case through twelve cables attached to brackets installed inside the case periphery at station 26.00. The loads were applied in increments listed in Table I to a maximum of 200 per cent design limit load. Lateral deflections indicated by the dial indicators were recorded at each increment. The loads were relaxed between increments, at which time the Stresscoat patterns were marked and the permanent deformations indicated by the dial indicators were recorded.

The unit was cleaned and Stresscoated for Test Condition No. 2. The mounting and loading were identical to Test Condition No. 1 except the lateral loads were rotated 90 degrees counter clockwise (to an observer looking aft) about the longitudinal axis. Orientation and magnitude of limit loads are depicted in Fig. 7. The procedure was similar to that followed in the preceding test. Load increments are listed in Table II.

The case was next cantilever mounted as shown in Figs. 3 through 5 (Test Condition No. 3). Orientation and magnitude of limit loads were as shown in Fig. 6. The lateral loads simulated combined air and inertia loads as before. The longitudinal load was applied to simulate the inertia skin stresses between stations 40.34 and 52.25. Since no brackets had been installed at station 40.34 the load was applied through the brackets at station 26.00. Loads were applied in increments listed in Table III to a maximum of 200 per cent design limit load. Lateral deflections were recorded at each increment. The test was rerun with the lateral loads only in order to determine the restraining effect of the longitudinal loads on the lateral deflection. The loads were applied in increments listed in Table IV.

The lateral loads rotated 90 degrees about the longitudinal axis (in a counter clockwise sense to an observer looking aft) for Test Condition No. 4. The orientation and magnitude of limit loads are depicted in Fig. 7. Except for the above rotation the setup was identical to that used in Test Condition No. 3. Loads were applied to failure in increments listed in Table V. The lateral deflections were recorded for each increment.

Results

The unit withstood the four test conditions up to 200 per cent design limit load without exhibiting evidence of failure or yield. Largest deflection recorded at 200 per cent limit load was 1.570 inches, measured in Test No. 1, parallel to the lateral loads, at a point 2.75 inches from the front of the case. The case failed in Test No. 4 when the rivets connecting the case to the mounting ring failed at 280 per cent design limit load.

The load-deflection data for Test Condition No. 1 are listed in Table I and plotted in Fig. 8. The Stresscoat data for the same are listed in Table VI and depicted in Figs. 9 through 11.

The load-deflection data for Test Condition No. 2 are listed in Table II and plotted in Fig. 12. The load-strain data obtained from Stresscoat are listed in Table VII and depicted in Figs. 13 through 16.

The load-deflection data for Test Condition No. 3 are listed in Table III and plotted in Fig. 17. The load-deflection data for Test Condition No. 3 minus the longitudinal load are listed in Table IV.

Table V contains the load-deflection data for Test Condition No. 4 up to 260 per cent design limit load. The same are plotted in Fig. 18. The unit failed in this test when the rivets connecting the case to the mounting ring sheared at 280 per cent design limit load. Figure 19 is a photograph depicting the above failure.

Conclusions

The TX-28 forward case is capable of withstanding all test requirements imposed to 200 per cent limit load.

R. I. Butler

R. I. BUTLER - 1612-2

Approved by: Paul H. Adams

PAUL H. ADAMS - 1612

RIB:1612-2:as

Copy to:
W. A. Gardner, 1610
D. M. Bruce, 1282
C. L. Gomel, 5523
R. K. Smeltzer, 7221-3
Tech. Ref. File, Bldg. 880, 7221-3

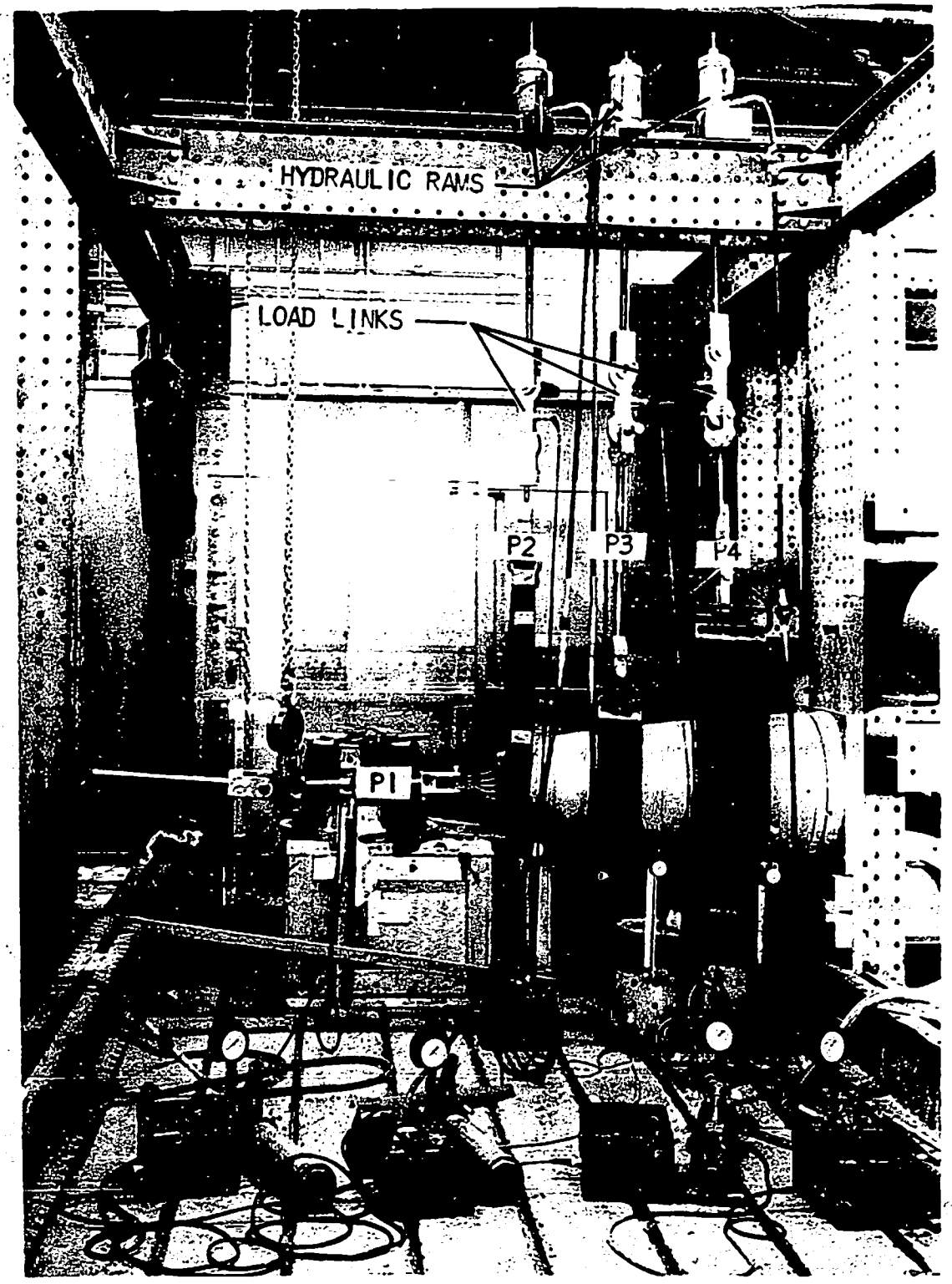

FIG. 1 -- TEST SETUP FOR TEST CONDITION NO. 1 -- STATIC TEST OF TX-28.

D# 87393

REF. SYM: 1612 (417)
PROJECT NO. TM-481

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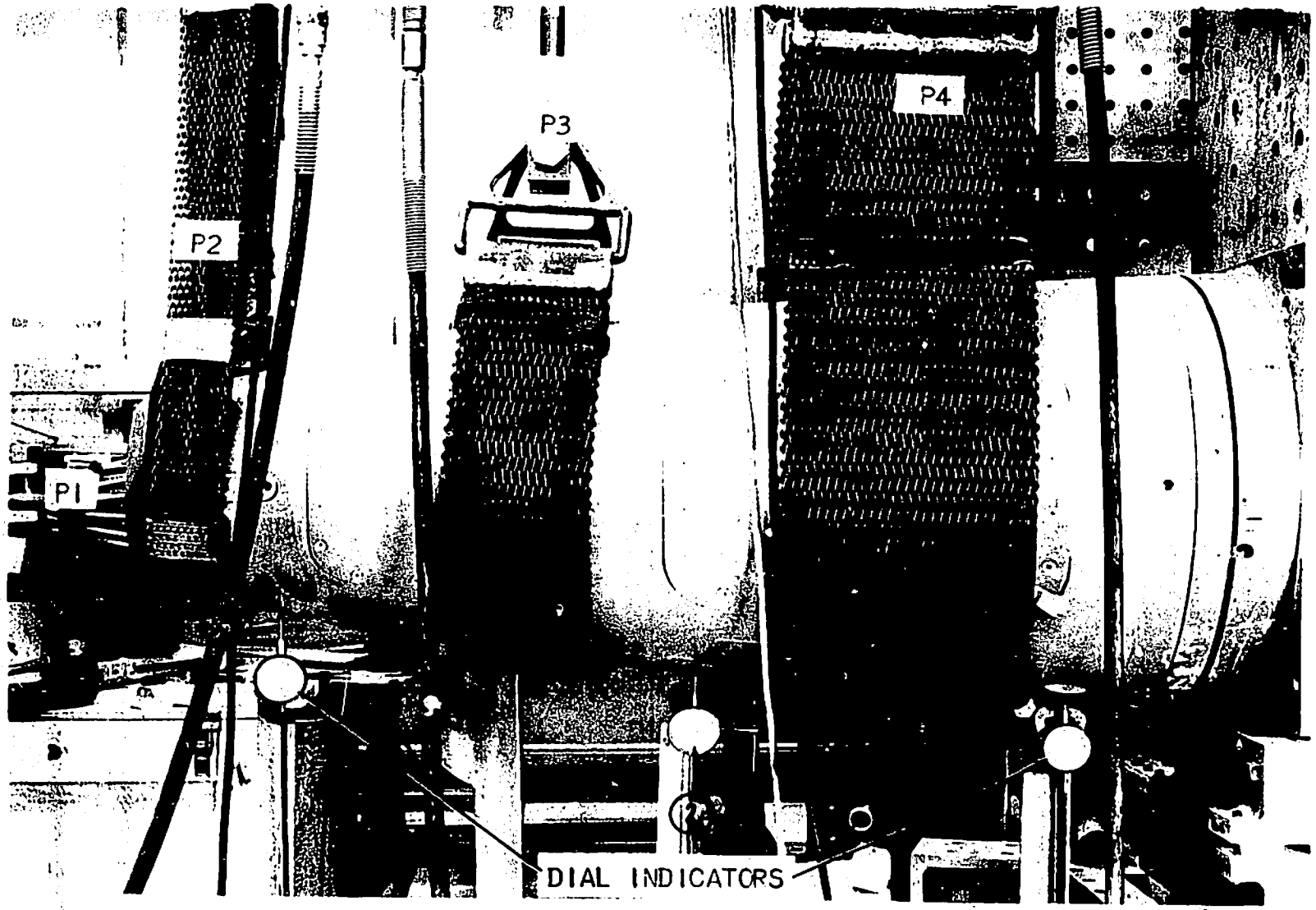

FIG. 2 -- TEST SETUP FOR TEST CONDITION NO. 1 -- STATIC TESTING

Dwt 87400

REF. SYM: [illegible]
PROJECT NO. [illegible]

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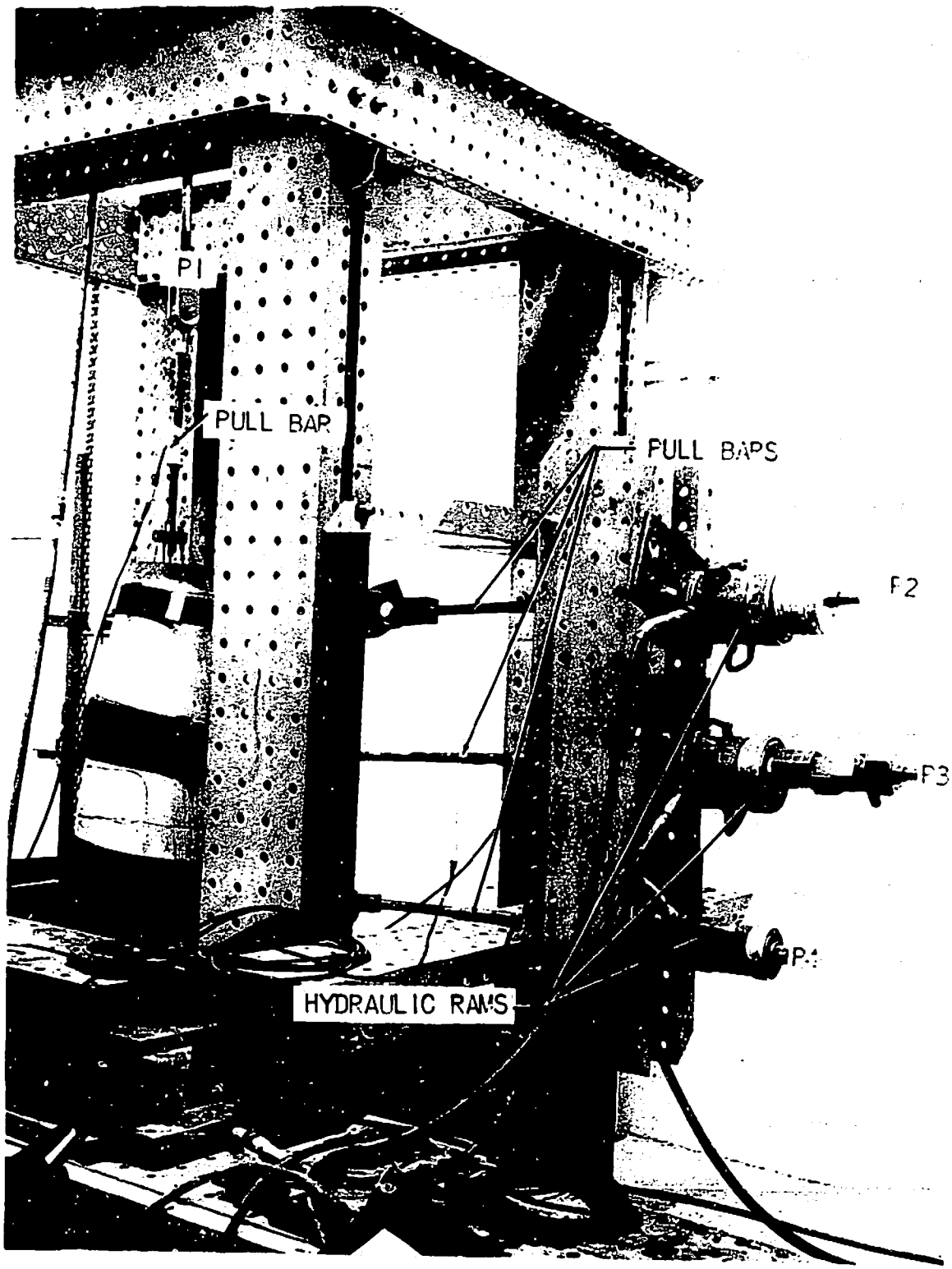

FIG. 3 -- TEST SETUP FOR TEST CONDITION NO. 3 -- STATIC TEST OF TX-28.

D# 87348

REF. SYM: 1612 (417)
PROJECT NO. TM-421

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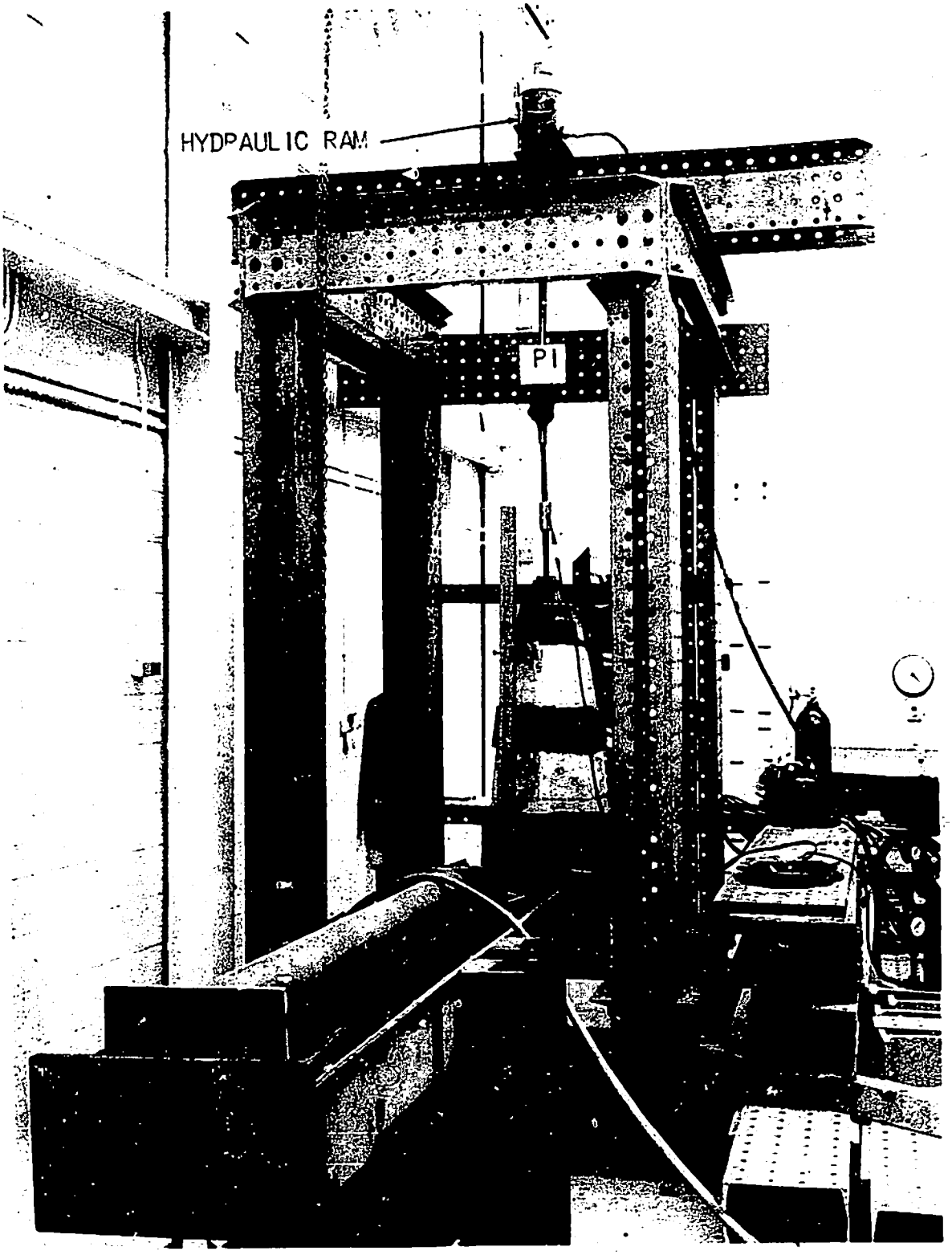

FIG. 4 -- TEST SETUP FOR TEST CONDITION NO. 3 -- STATIC TEST OF TX-28.

REF. SYM: 1612 (417)
PROJECT NO. TM-481

D# 87399

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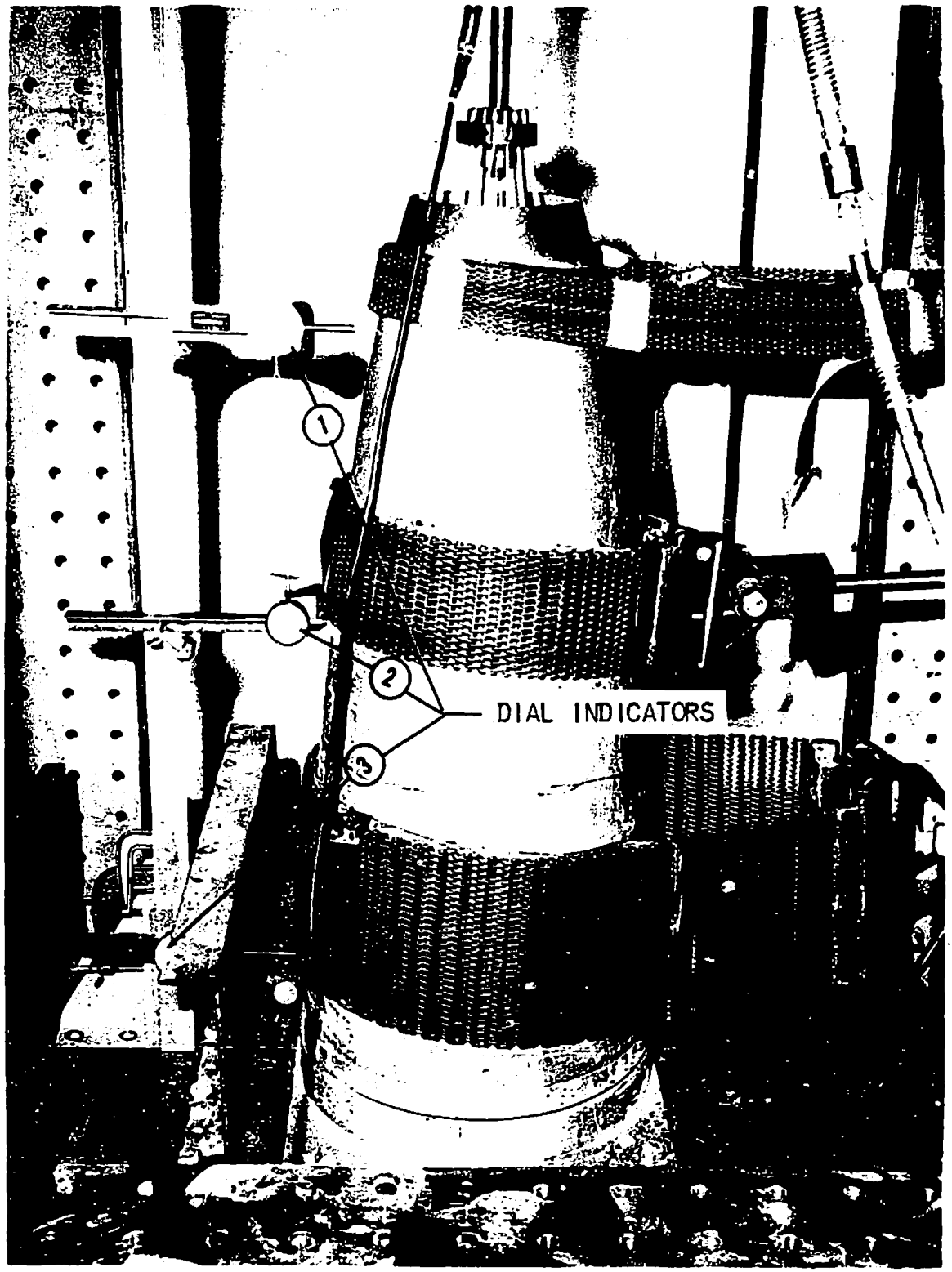
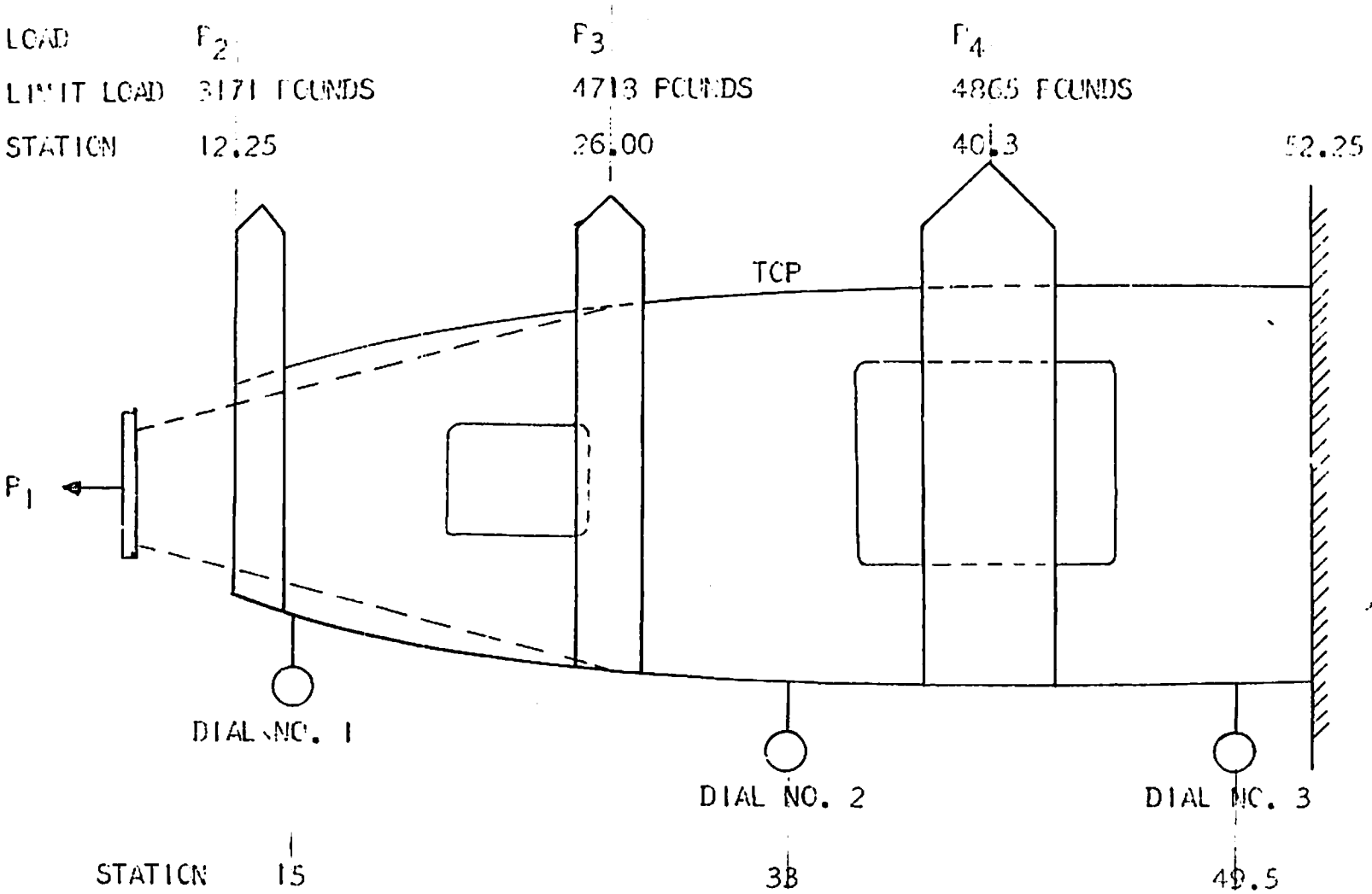


FIG. 5 -- TEST SETUP FOR TEST CONDITION NO. 3 -- STATIC TEST OF TX-28.

REF. SYM: 1612 (417)
PROJECT NO. TM-491

D# 87401



LIMIT LOAD FOR P_1: 5,547 POUNDS - TEST CONDITION NO. 1
11,963 POUNDS - TEST CONDITION NO. 3

FIG. 6 -- ORIENTATION AND MAGNITUDE OF LIMIT LOADS AND LOCATION OF DIAL INDICATORS -- STATIC TEST OF TX-28 CONDITIONS NOS. 1 AND 3.

REF. SYM: 1612 (417)
PROJECT NO. TX-481

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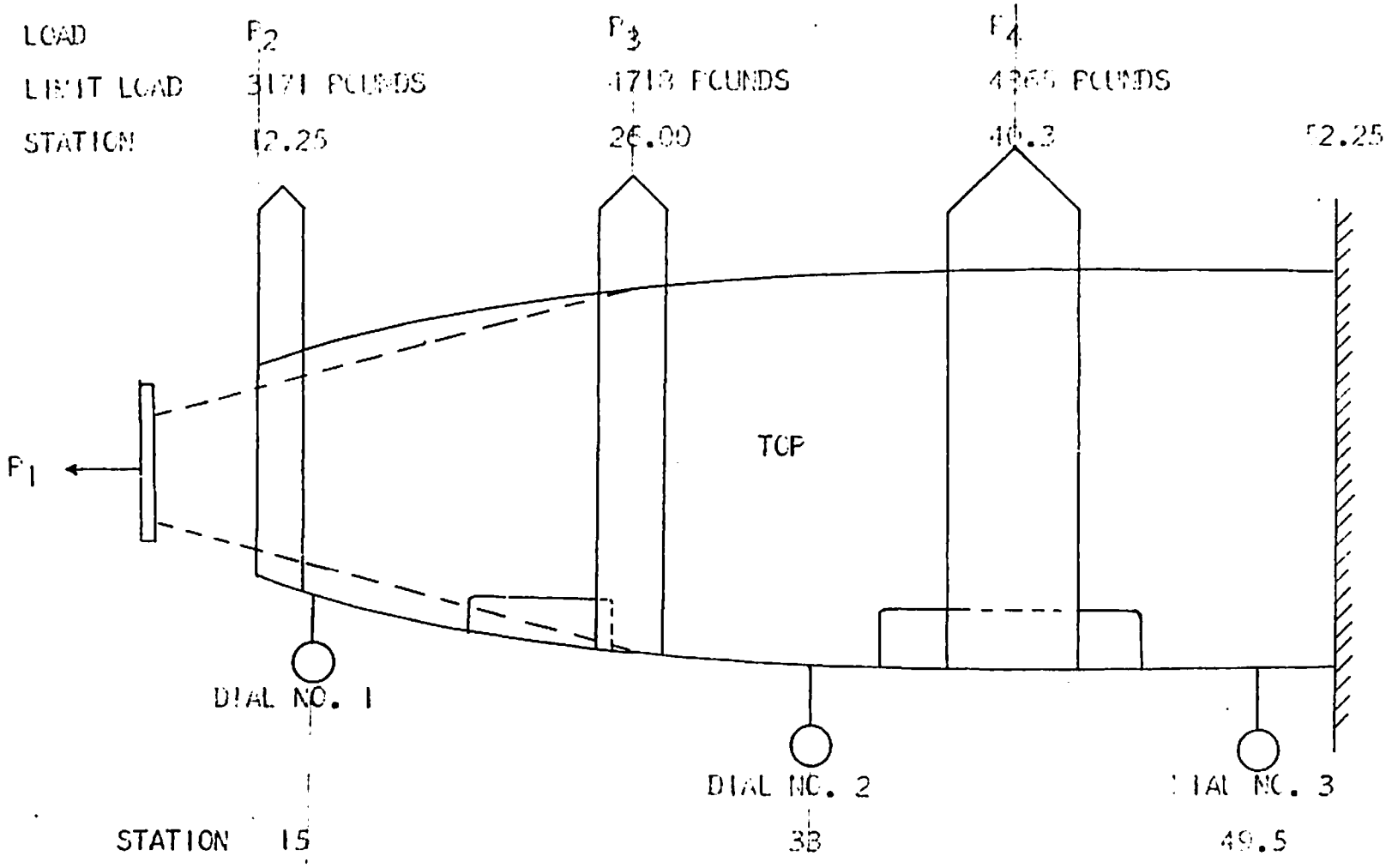

LIMIT LOAD FOR F_1: 5,547 POUNDS - TEST NO. 2
11,963 POUNDS - TEST NO. 4

FIG. 7 -- ORIENTATION AND MAGNITUDE OF LIMIT LOADS AND LOCATION OF DIAL INDICATORS -- STATIC TEST OF TX-28 CONDITIONS NOS. 2 AND 4.

REF. SYM: 1612 (417)
PROJECT NO. TM-481

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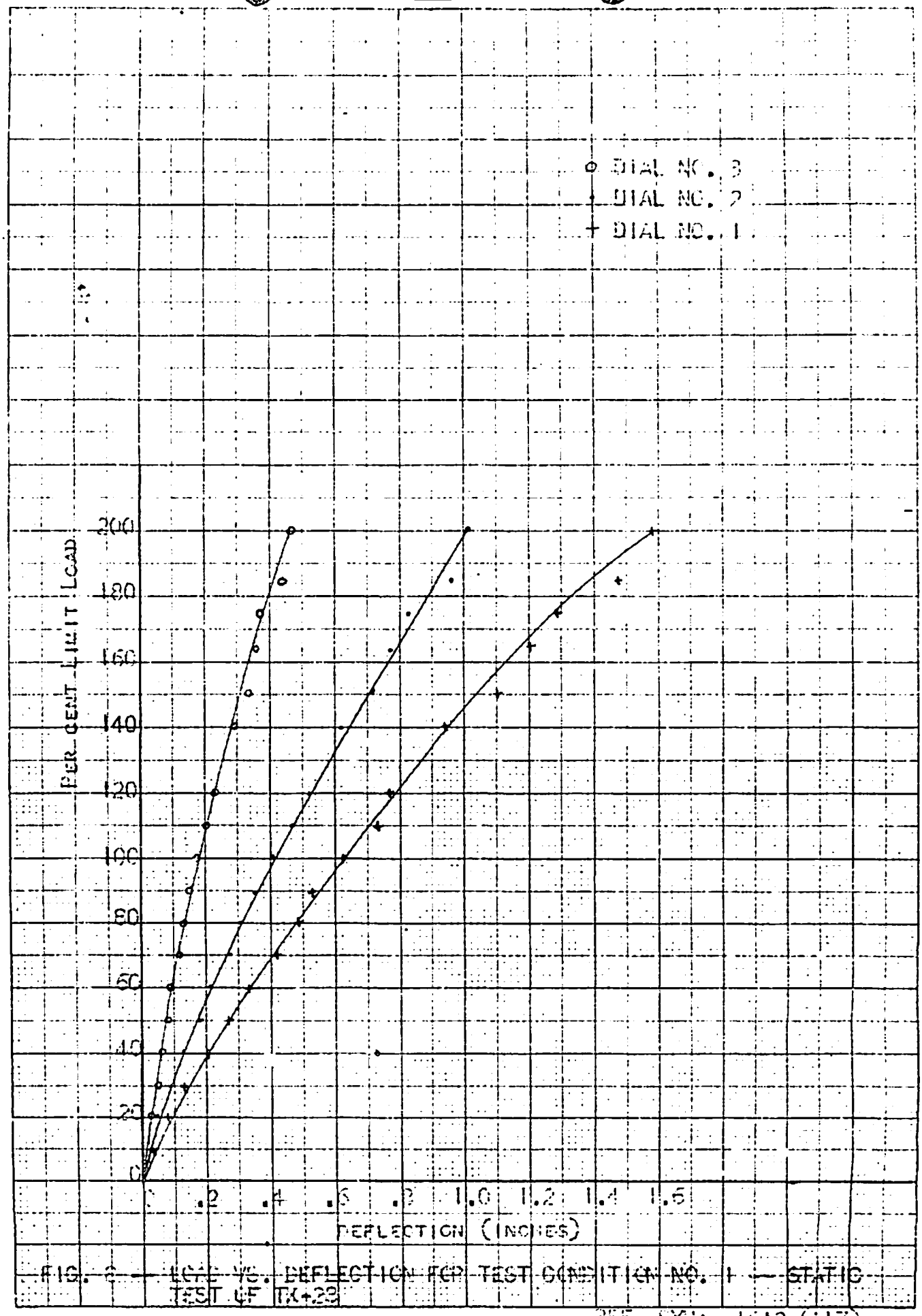

FIG. 2 — LOAD VS. DEFLECTION FOR TEST CONDITION NO. 1 — STATIC TEST OF TX-23

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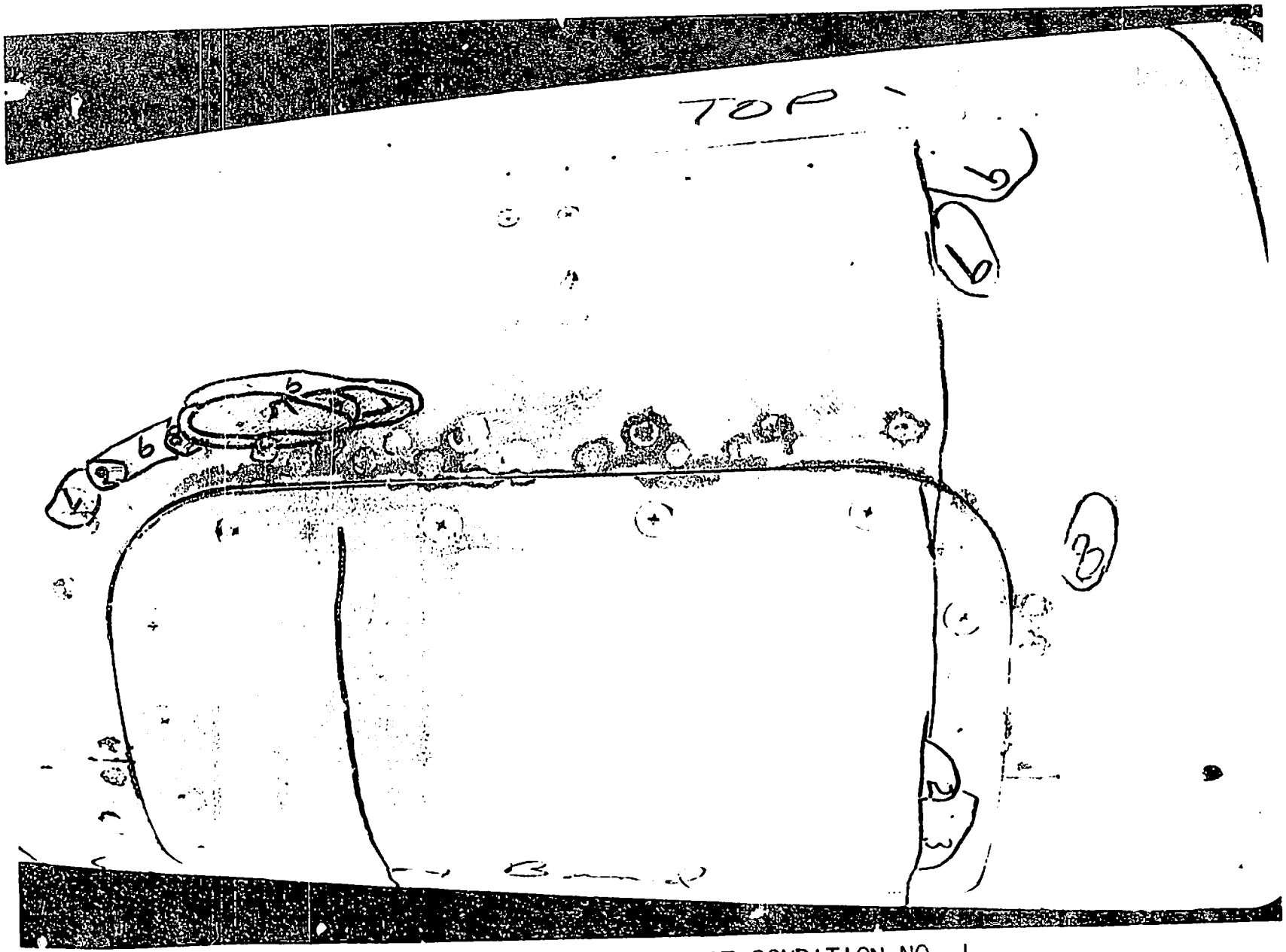

FIG. 9 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 1 -- STATIC TEST OF TX-28.

REF. SYM: 1612 (417)
PROJECT NO. TM-481

D# 844451

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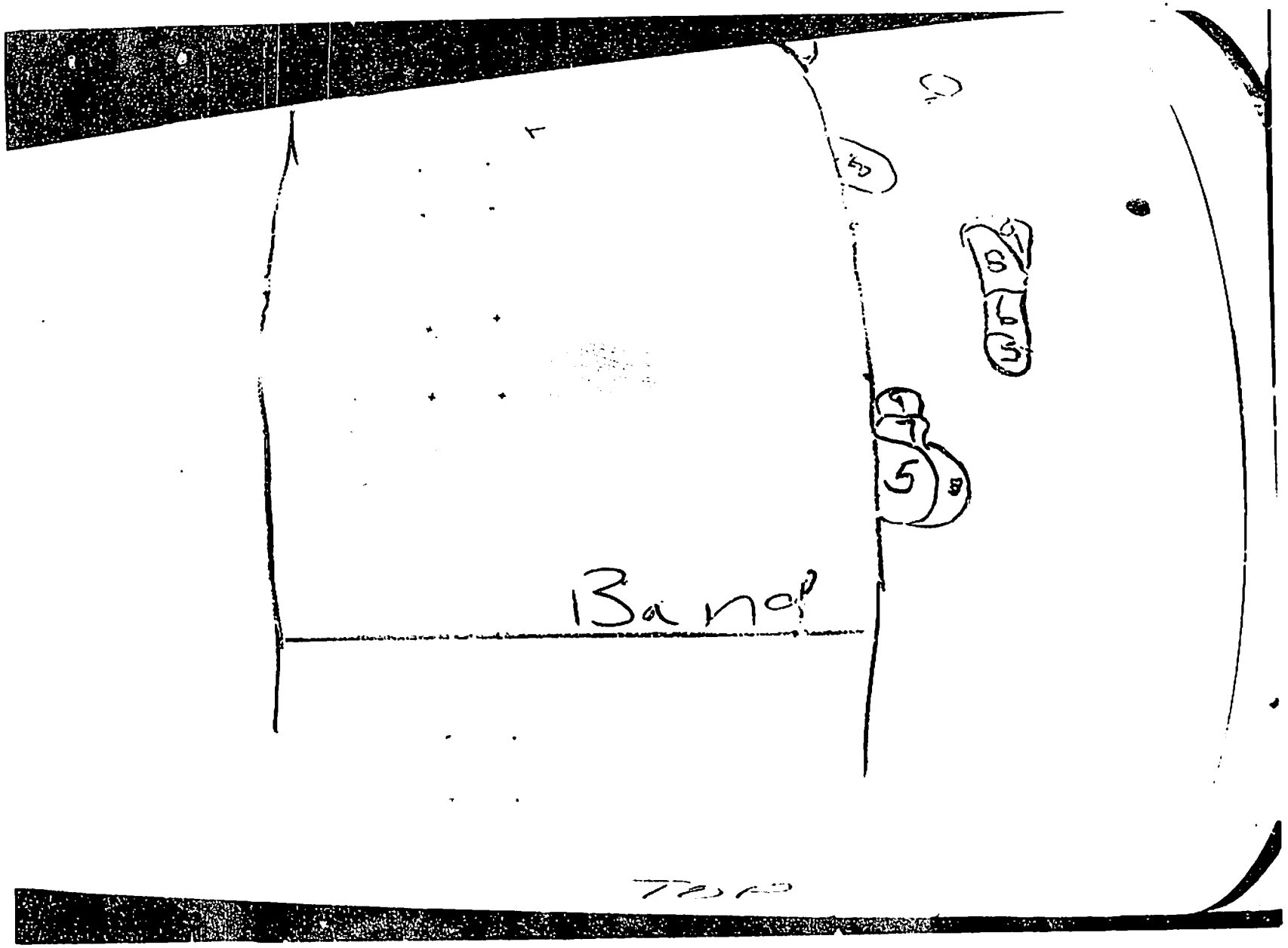

FIG. 10 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 1 -- STATIC TEST OF TX-28.

D# 84450

REF: SYM: 1612 (417)
PROJECT NO. TM-481

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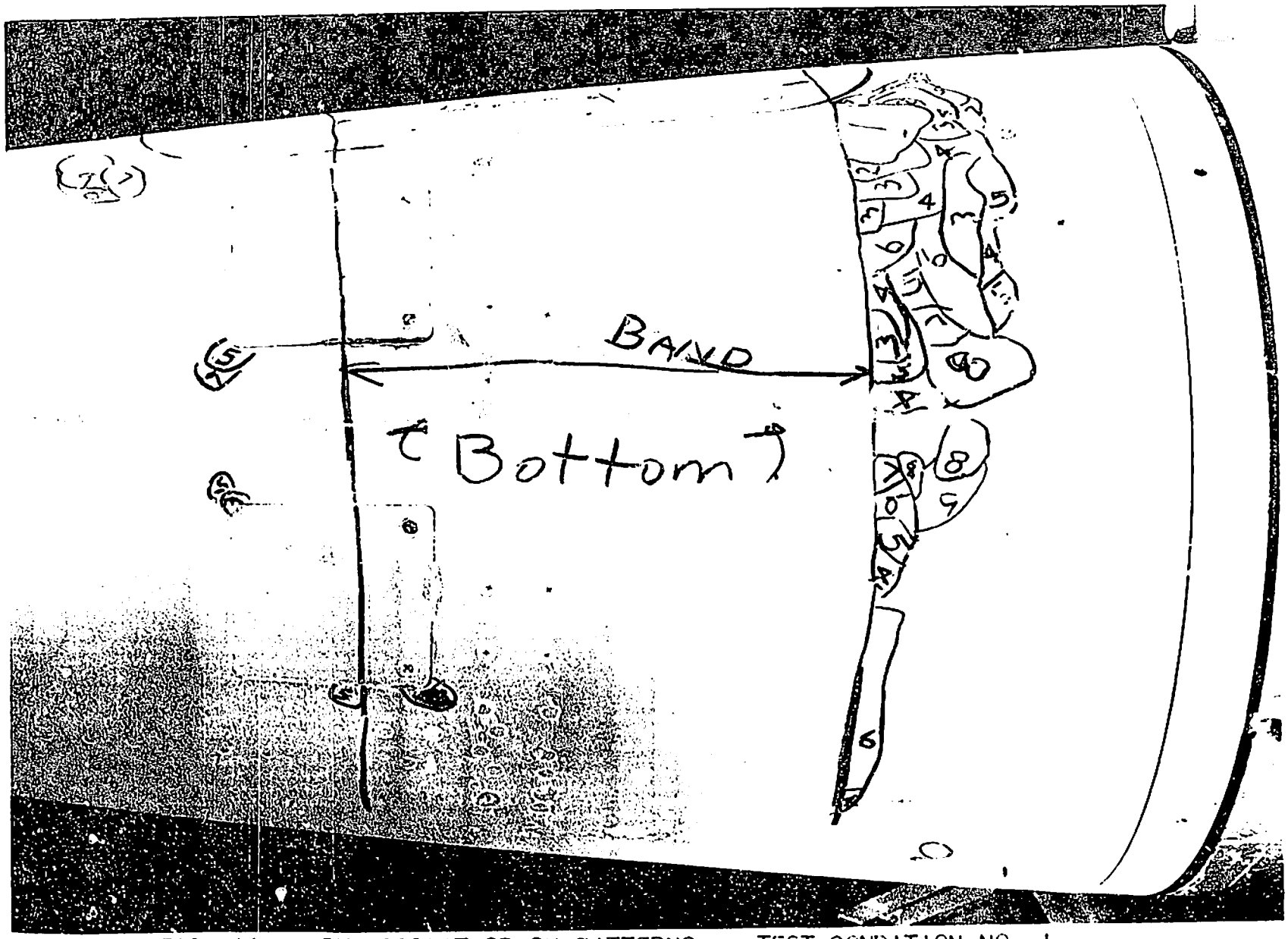

FIG. 11 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 1 -- STATIC TEST OF TX-28.

D# 84449

REF. SYM: 1612 (417)
PROJECT NO. TM-481

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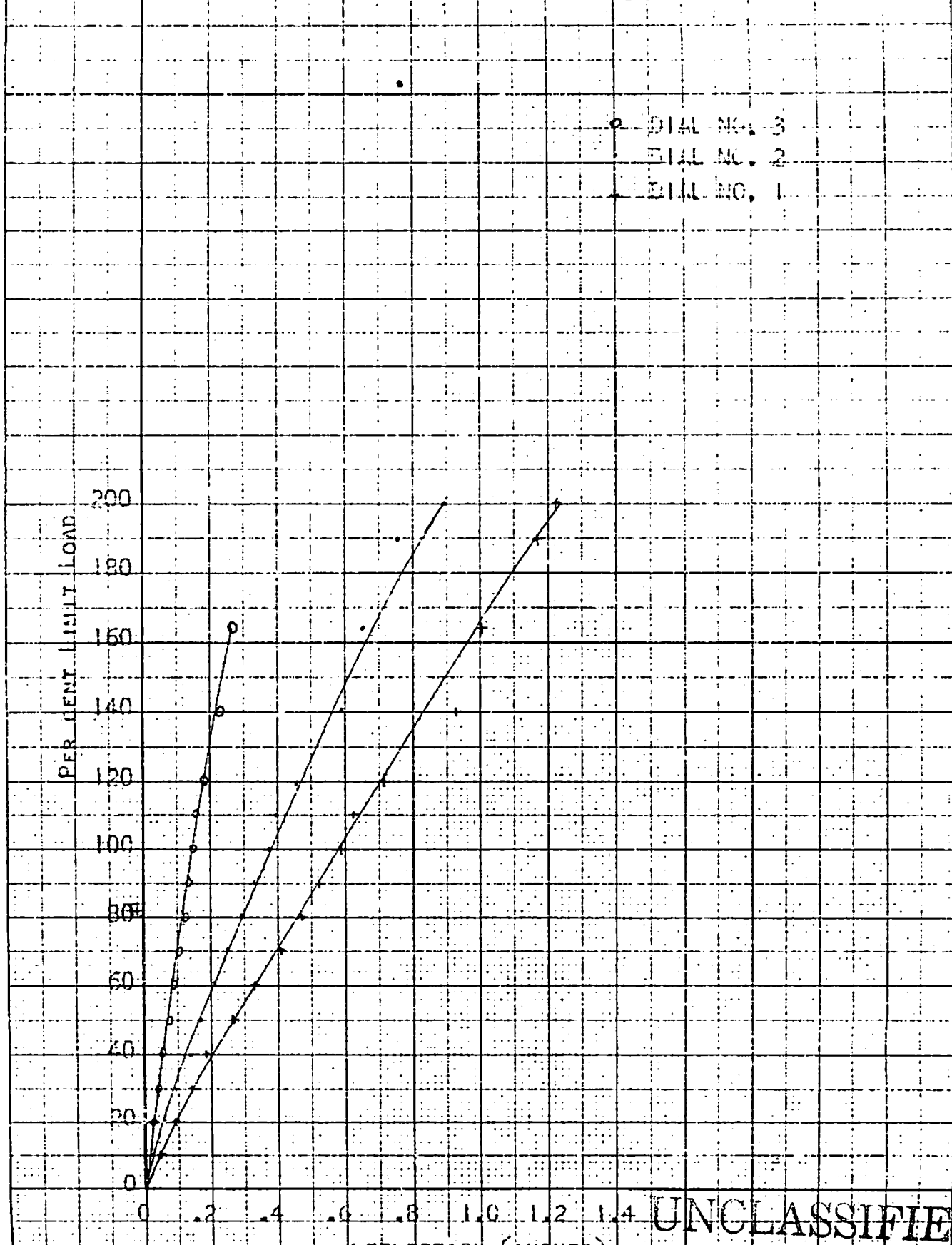

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FIG. 12 -- LOAD VS. DEFLECTION FOR TEST CONDITION NO. 2 -- STATIC TEST OF TX-28.

REF. SYM: 1017 (417)
PROJECT NO. TM-481

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[redacted]

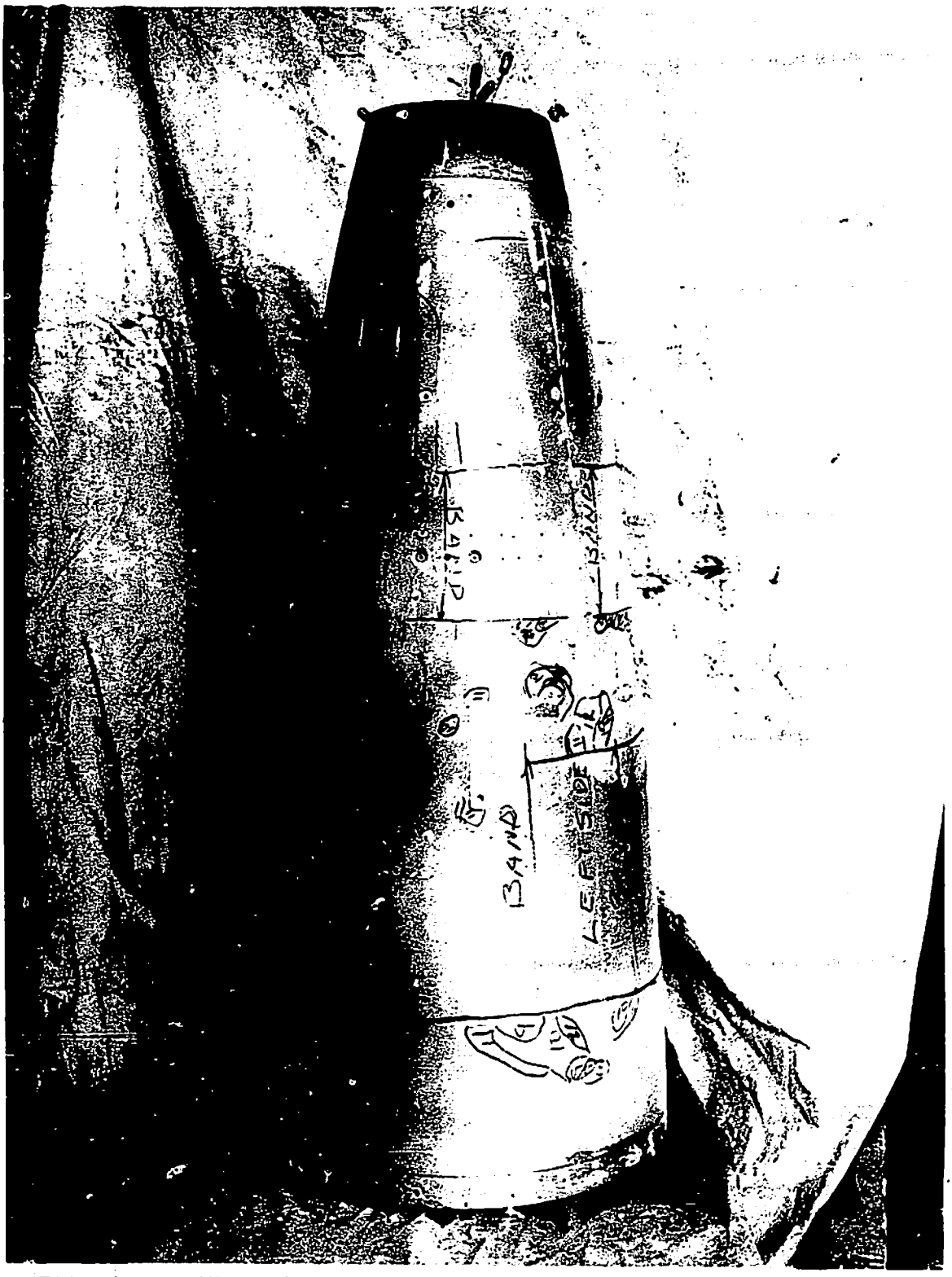

FIG. 13 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 2 -- STATIC TEST OF TX-28.

D# 87344

REF. SYM: 1612 (41)
PROJECT NO. TX-481

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[redacted]

#654

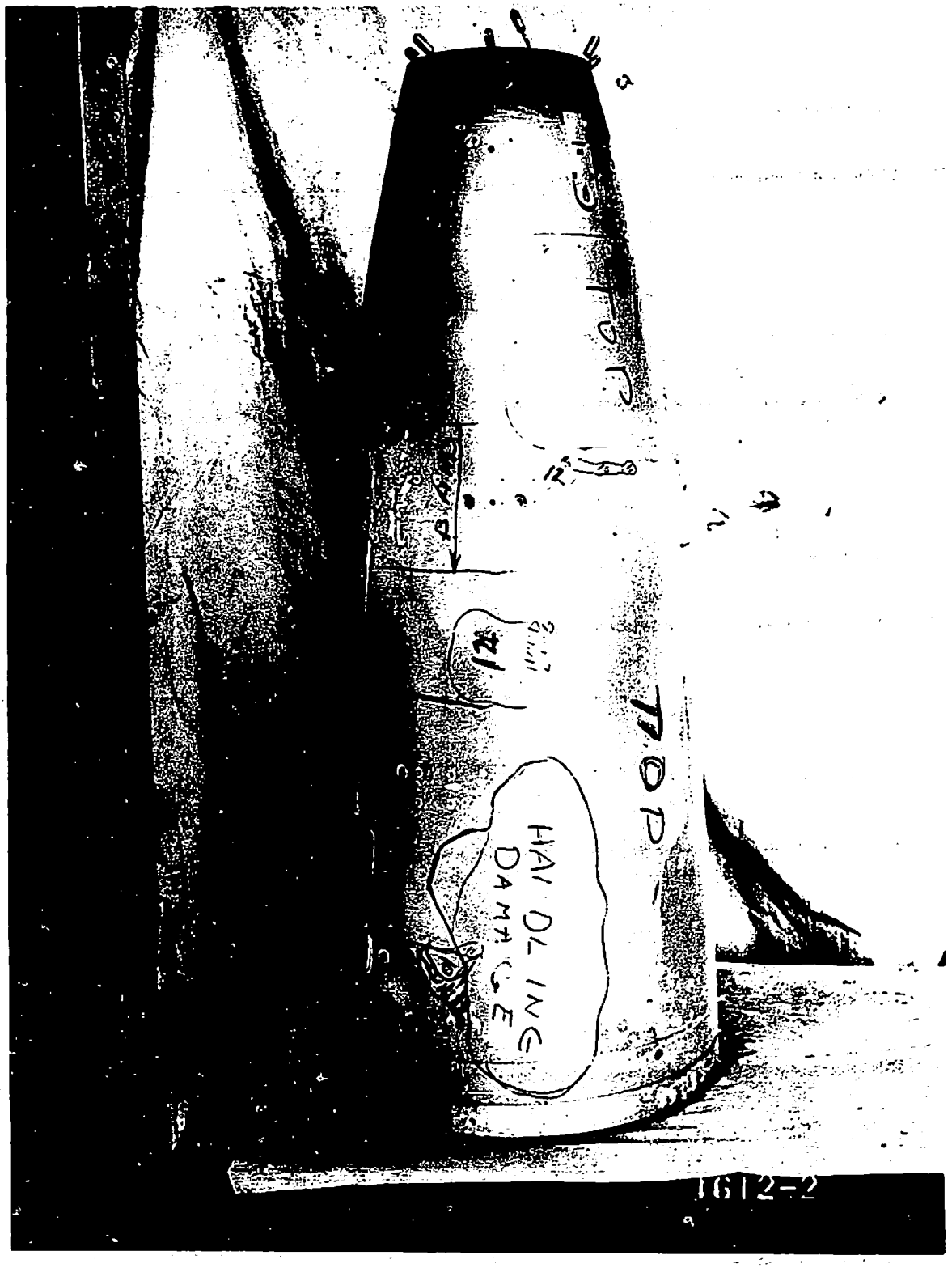

FIG. 14 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 2 -- STATIC TEST OF TX-28.

D# 87393

REF. SYM: 1612 (417)
PROJECT NO. TX-481

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[redacted]

FIG. 15 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION NO. 2.-- STATIC TEST OF TX-28.

REF. SYM: 1612 (41)
PROJECT NO. TN-4

D# 87397

[redacted]

#656

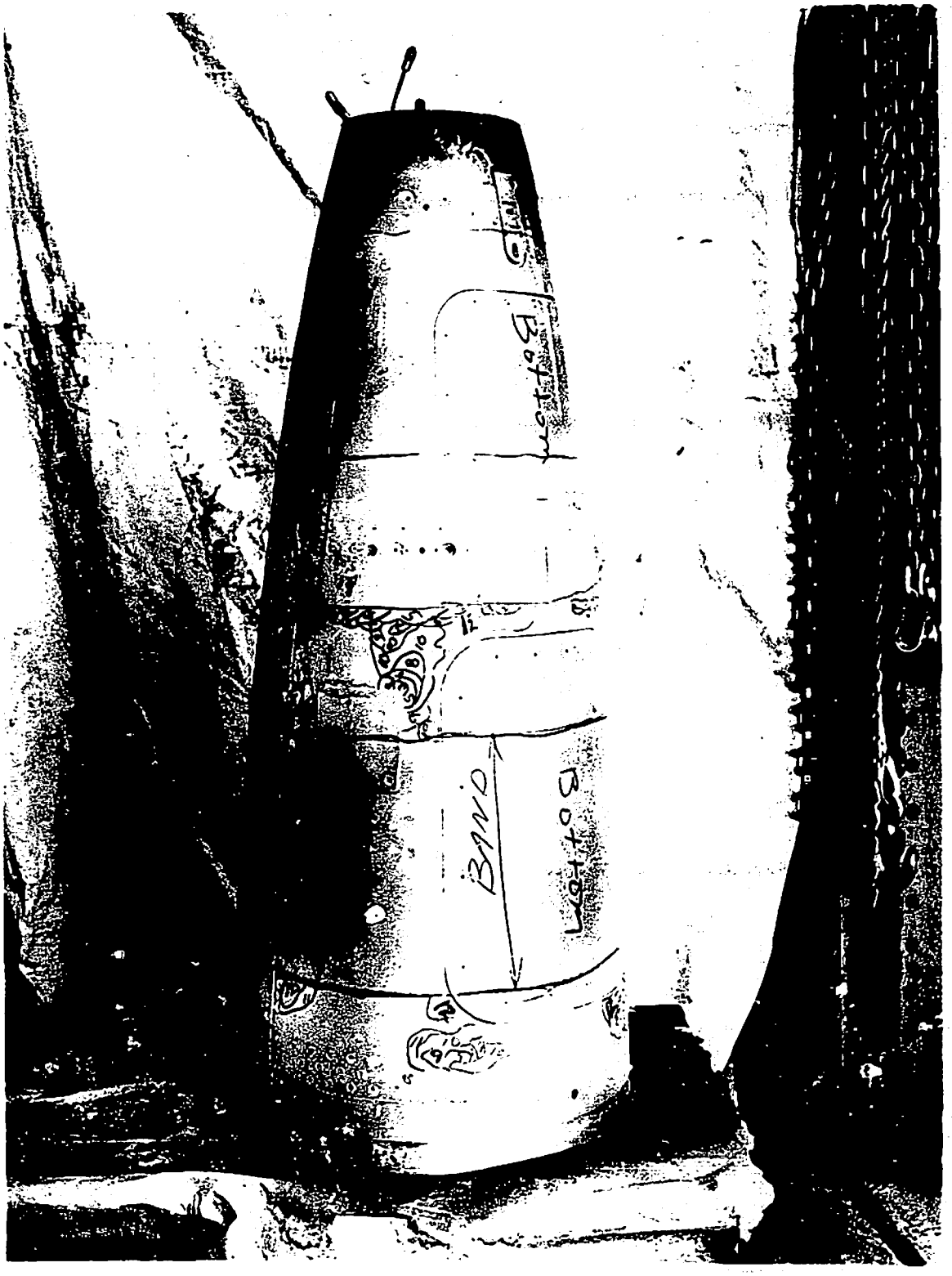

FIG. 16 -- STRESSCOAT CRACK PATTERNS -- TEST CONDITION [illegible] -- STATIC TEST OF DX-2B.

D# 87396

REF. SYM: [illegible]
PROJECT NO. [illegible]

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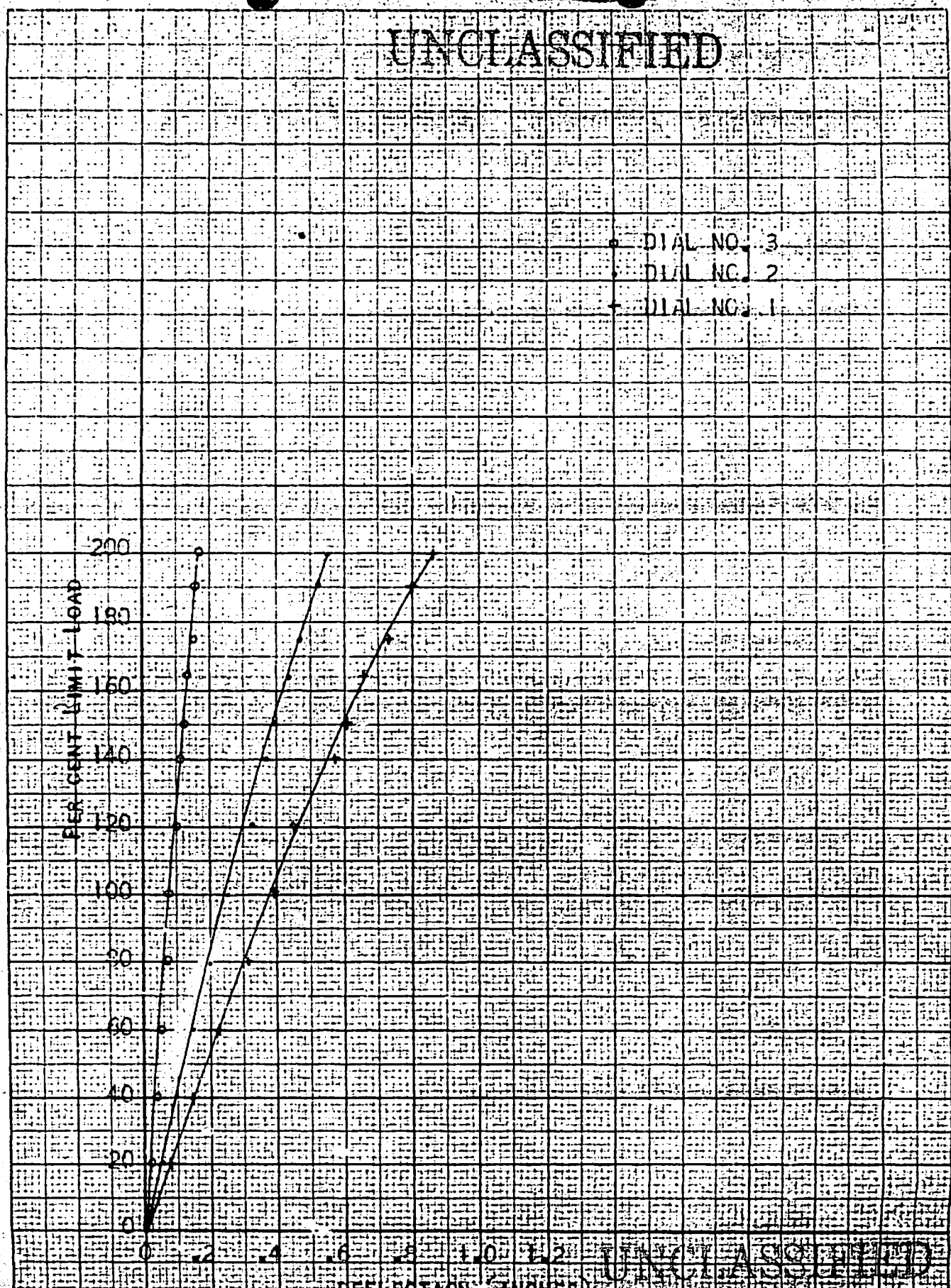

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FIG. 17 -- LOAD VS. DEFLECTION FOR TEST CONDITION NO. 5 -- STATIC TEST OF TX-23.

K+E 10 X 10 TO THE ½ INCH 359-11
KEUFFEL & ESSER CO. MADE IN U.S.A.

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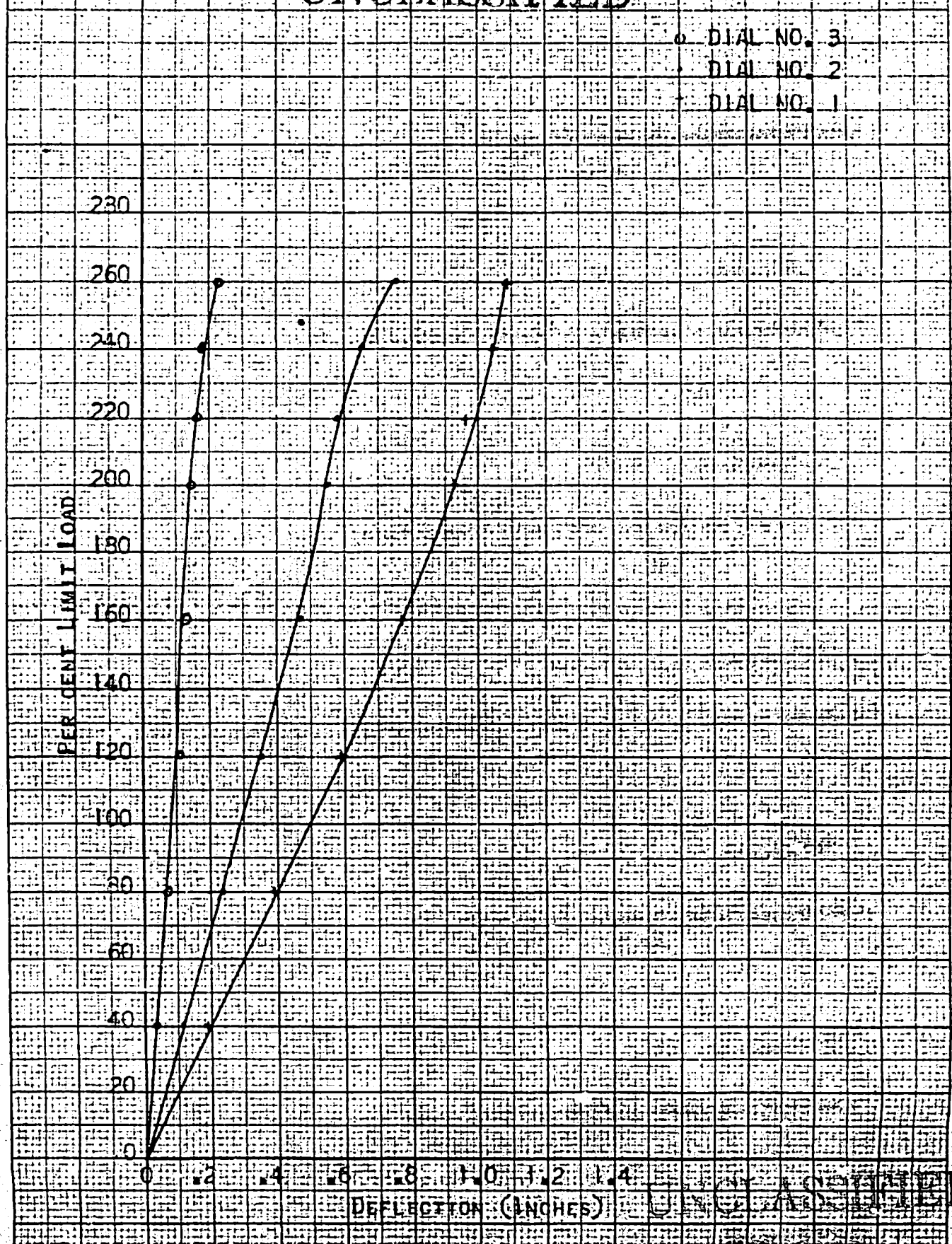

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FIG. 18 -- LOAD VS. DEFLECTION FOR TEST CONDITION NO. 4 -- STATIC TEST OF TX-28.

[redacted] -23-
REF. SYM. 1612 (417)
PROJECT NO. TV-81

K&E 10 X 10 TO THE ½ INCH 359-11 KEUFFEL & ESSER CO. MADE IN U.S.A.

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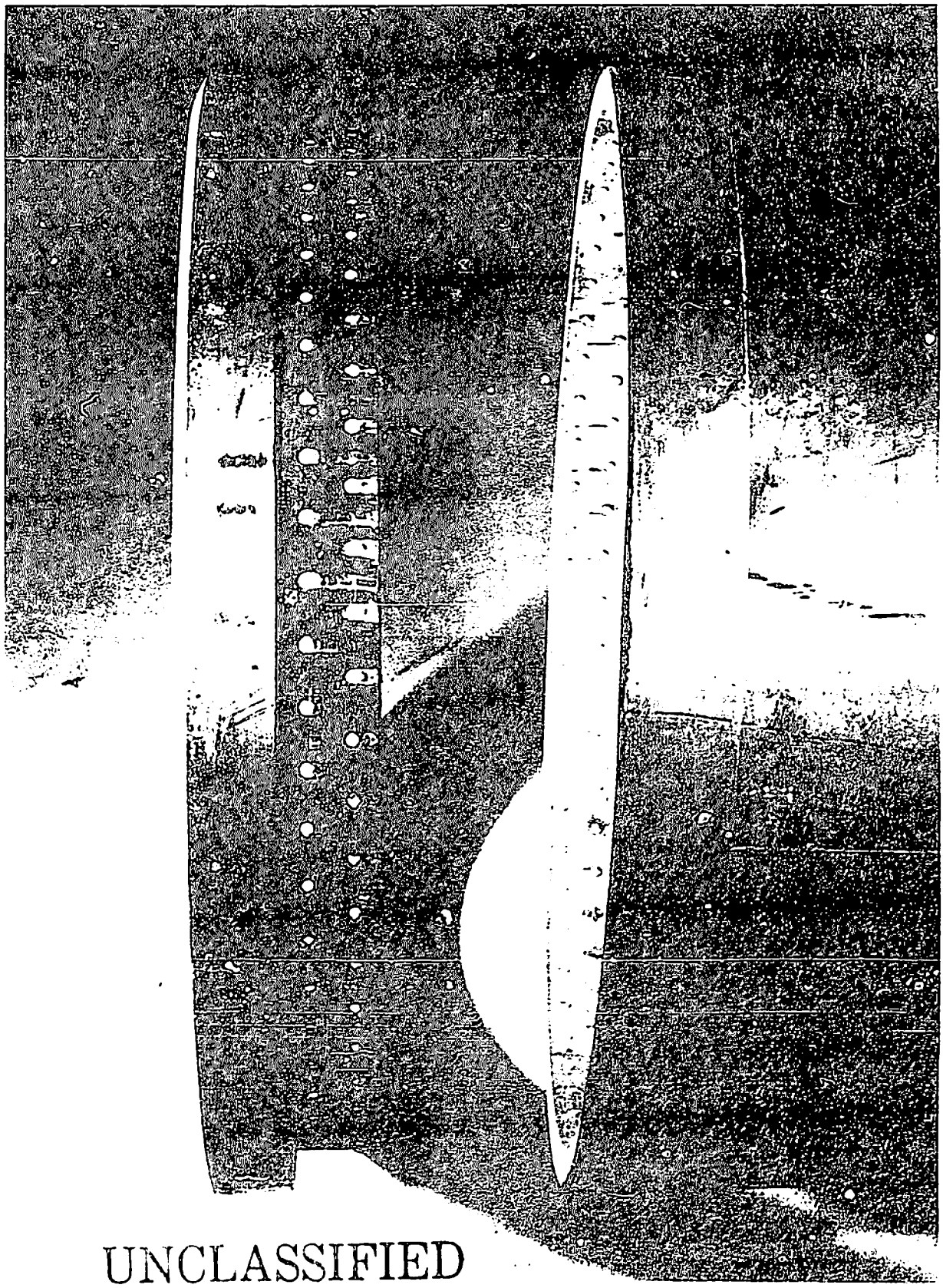

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FIG. 19 -- SHEARED RIVETS AT BASE OF CASE SECTION -- STATIC TEST OF TX-28 [redacted]

D#85463

REF. SYM: 1612 (417)
PROJECT NO. TM-481

TABLE I

LOAD-DEFLECTION DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 1

Per Cent Limit Load	Deflection (Inches) Dial No. 1 Deflection	Dial No. 1 Set	Dial No. 2 Deflection	Dial No. 2 Set	Dial No. 3 Deflection	Dial No. 3 Set
0	0	0	0	0	0	0
10	.028		.010		.004	
20	.069		.045		.022	
30	.131	.021	.084	.012	.041	.004
40	.202	.040	.128	.028	.060	.006
50	.270	.060	.178	.045	.078	.013
60	.329	.071	.212	.057	.094	.019
70	.413	.094	.277	.078	.119	.026
80	.484	.122	.313	.102	.134	.045
90	.532		.347		.149	
100	.632	.132	.404		.176	.062
110	.730	.156	.465	.120	.204	.070
120	.782	.166	.520	.128	.232	
140	.954	.212	.609	.160	.289	.080
150	1.105	.232	.714	.176	.333	.113
164	1.205	.255	.772	.202	.357	.123
175	1.280		.822		.375	
185	1.465		.970		.436	
200	1.570	.356	1.011	.268	.463	.163

TABLE II

LOAD-DEFLECTION DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 2

Per Cent Limit Load	Deflection (Inches)					
	Dial No. 1		Dial No. 2		Dial No. 2	
	Deflection	Set	Deflection	Set	Deflection	Set
0	0	0	0	0	0	0
10	.039		.017		.005	
20	.086		.062		.022	
30	.148	.019	.096	.008	.040	.003
40	.194	.035	.140	.020	.057	.011
50	.270	.027	.174	.017	.073	.003
60	.338	.032	.214	.021	.090	.006
70	.401	.039	.255	.023	.105	.008
80	.466	.052	.294	.024	.121	.010
90	.525	.065	.336	.028	.138	.014
100	.595	.068	.378	.026	.154	.015
110	.623	.077	.395	.033	.160	.018
120	.715	.094	.459	.039	.182	.021
140	.932	.123	.596	.059	.227	.028
164	1.010	.133	.647	.062	.262	.028
190	1.174		.755		*	
200	1.220	.221	.899	.079		

* Dial indicator out of travel.

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Ref. Sym: 1612 (417)
Project No. TX-481

TABLE III

LOAD-DEFLECTION DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 3

Per Cent Limit Load	Deflection (Inch) Dial No. 1	Dial No. 2	Dial No. 3
0	0	0	0
20	.078	.050	.015
40	.143	.097	.030
60	.221	.146	.045
80	.306	.201	.061
100	.395	.258	.079
120	.454	.324	.097
140	.573	.372	.104
150	.613	.399	.123
164	.656	.439	.132
175	.729	.472	.145
190	.799	.517	.157
200	.847	.548	.167
0	.041	.033	.014

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Project No. TM-481

TABLE IV

LOAD-DEFLECTION DATA

STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 3 Minus Longitudinal Load

Per Cent Limit Load	Deflection (Inches) Dial No. 1	Dial No. 2	Dial No. 3
0	0	0	0
40	.086	.056	.019
80	.246	.156	.049
120	.486	.243	.076
150	.516	.327	.100
164	.574	.363	.110
175	.621	.392	.119
200	.731	.461	.140
0	.036	.021	.008

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TABLE V

LOAD-DEFLECTION DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 4

Per Cent Limit Load	Deflection (Inches) Dial No. 1	Dial No. 2	Dial No. 3
0	0	0	0
40	.192	.115	.035
80	.395	.240	.070
120	.587	.355	.101
160	.777	.468	.131
200	.934	.552	.153
220	.957	.580	.160
240	1.041	.658	.179
260	1.086	.750	.230

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TABLE VI

LOAD-STRAIN DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 1

Per Cent Limit Load	Stresscoat Sensitivity (Microinches Per Inch)	Pattern No.
0	850	
10		
20		
30		
40	800	
50		
60		
70		
80	850	1
90		2
100		3
110		4
120		5
130		6
140		7
164	850	8
200		9

TABLE VII

LOAD-DEFLECTION DATA
STATIC TEST OF TX-28 FORWARD CASE

Test Condition No. 2

Per Cent Limit Load	Stresscoat Sensitivity (Microinches Per Inch)	Pattern No.
0	680	
20		
40	680	1
50		2
60		3
70		4
80	680	5
90		6
100		7
110		8
120		9
140		10
164	650	11
200		12