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DATED: 7/28/98

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0566

JUL 16 1952

Ref. Symbol:1532(31)
Project No. TM-59

MR. C. F. ROBINSON - 1243

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Re: Dynamic Ejector Performance Test of the TX-7 (Concrete-Filled Space Chamber)

SUMMARY OF RESULTS

The ejector tests discussed in this report were conducted to determine the effects of various types of ejectors on the TX-7 with a concrete-filled space chamber.

The following ejectors were tested: 1) Douglas cartridge type. 2) Republic air piston type. 3) Mc Lean air piston type. 4) Mc Lean cartridge type.

With the two cartridge type ejectors, the energy output (which has been computed from the weight of the TX-7 unit and the ejection displacement) is a linear function of the amount of charge. With the air piston type of ejectors, the energy output increases with increased charge pressure only up to a pressure of 2000 psi; at higher charge pressures the energy output of the air piston ejectors remains unchanged or is slightly decreased.

The various ejectors may be listed in order of increasing maximum energy output as follows: Mc Lean air piston type ejector, Condition V; Mc Lean air piston type ejector, Condition II; Republic air piston type ejector; Douglas cartridge type ejector; Mc Lean cartridge type ejector, 0.081 inch diameter orifice; Mc Lean cartridge type ejector, 0.062 inch diameter orifice; and Mc Lean cartridge type ejector, no orifice.

At maximum energy output the duration of the ejector power strokes varied from 0.065 to 0.196 second with the various ejectors.

On the basis of maximum vertical acceleration (with respect to the longitudinal axis of the TX-7) at the center of gravity, the various ejectors may be listed in the following order: Mc Lean cartridge type, 3.7 g (orifice size has little effect on maximum vertical acceleration at the center of gravity); Republic air piston type, 6.6 g; Mc Lean air piston type, Condition V, 7.7 g; Mc Lean air piston type, Condition II, 8.2 g; and Douglas cartridge type, 8.8 g.

For all the ejectors tested, the stresses measured on the unit were below the yield point stress of the material.

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OBJECT OF TEST

The dynamic ejector tests of the TX-7 were conducted to determine the compatibility of the various bomb ejectors when used with the TX-7.

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1 Classification Retained
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3 Contains No DOE Classified Information
4 Coordinate With: no
5 Contains UCNI?
6 Comments:

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REASON FOR TEST

The test was performed in accordance with Work Order Authorizations dated October 16, 1951, November 17, 1951, January 16, 1952, and April 16, 1952, from Mr. C. F. Robinson, 1243, to Mr. T. B. Morse, 1530, and Preliminary Outline of the Dynamic Ejector Performance Test of the TX-7 at Sandia (Z-28978), from Mr. F. A. Gagliardi, 1243, to Mr. C. F. Robinson, 1243.

FUNCTION OF OBJECT TESTED

Ejector type bomb releases are necessary when the TX-7 is externally carried on military aircraft from which drops are made when the aircraft is at an angle other than 0 degrees with the horizontal.

SUMMARY OF PAST TESTS

No previous ejector tests have been performed by Department 1530.

SETUP FOR TEST

A. The following ejectors were tested:

1. Douglas Aircraft Corporation bomb ejector, Part No. 5256285 (2 hooks, 14-inch centers). The unit is powder operated (Mk 1 Mod 2 cartridge). The rack is 18 inches long and 18 inches high, and weighs approximately 30 pounds. Upon detonation of a cartridge within the ejector combustion cylinder, pressure is generated which forces an ejector foot against the bomb. The foot moves with the bomb for a distance of approximately four inches, at which point the piston reaches a stop, and the bomb is projected normal to the aircraft.

2. Republic Aircraft Corporation special pylon, using the AERO 61A Douglas 3 hook rack (20-inch centers), Serial No. 132 F. The Republic TX-7 carrying pylon is a streamlined structure bolted to the underside of the left wing, using the same supports as the regular pylon. Housed in the pylon are the bomb rack (AERO 61A), a pneumatic ejection system, and the manual arming mechanism with its related linkage.

3. Mc Lean Development Laboratories 4 hook release and ejector, Model 28-0100 with a cylinder 3.25 inches in diameter and electropneumatic actuated stores release. Only two hooks, on 14-inch centers, were used. Five ejector foot positioning holes are provided to allow for application of the ejection force at any one of five points from the midpoint between the hooks to 4-1/2 inches aft of the midpoint. The ejector foot displacement stroke is 4-3/4 inches. Two ejector foot positions were used in these tests.

Under Condition II, the ejector foot was in the second positioning hole, thus placing the ejection force at the first point aft of the midpoint between the hooks. Under Condition V, the ejector foot was in the fifth positioning hole, thus placing the ejection force as far as possible aft of the midpoint between the hooks.

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4. Mc Lean Development Laboratories, 4 hook release and ejector, modified to be powder operated (Mk 1 Mod 2 cartridge). The ejector foot displacement stroke is 14 inches instead of the 4-3/4 inches previously used. The modification consisted of changing the power cylinder from pneumatic to gas, and replacing the gear mechanism with a bar linkage. The ejector foot was fixed so as to apply the ejection force at Station 74. The gas cylinder of this ejector was provided with a bleed-off port for varying the maximum gas pressure developed. This ejector was tested using an orifice 0.081 inch in diameter (maximum bleed-off), an orifice 0.062 inch in diameter, and no orifice (bleed-off port plugged).

B. The following equipment was used:

1. Dynamic jig No. 1 south of Building 809, and dynamic jig No. 2 at Coyote Canyon

2. Two high frequency Miller amplifiers, 12-channel, Type C-3, Model No. CA-12, Serial Nos. 3 and 7, and two Miller oscillographs, 12-channel, Model H, Serial Nos. 159 and 161

3. Air compressors for compressing air to 2500 psi, and receivers, tubing, etc., for connection with air ejectors

4. Power supply, 28 volts d-c, with 25-ampere capacity

5. Power supply, 110 volts a-c

6. Firing delay box for Fastax, oscillographs, and ejectors

C. The TX-7 unit was instrumented with the following:

1. Statham accelerometers, ±50 g range. The locations of accelerometers on the unit are shown in Fig. 1. Serial numbers of the accelerometers may be found in Table I.

2. Baldwin SR-4 strain gages, Type A-3, lot number 232-11, gage factor 2.06 ±1 per cent; Type A-8, lot number 505, gage factor 1.81 ±2 per cent; Type AX-5, lot No. 505, gage factor 2.02 ±1 per cent, auxiliary factor 1/30. The locations of the strain gages on the unit are shown in Figs. 2, 3, and 4.

3. Schaevitz Engineering displacement gage, series 0, linear variable differential transformer, Type 040-L. The location of the displacement gage is shown in Fig. 1.

PROCEDURE

The dynamic jig was modified with a pendulum suspended from the main top box beam. The TX-7 was mounted vertically in the pendulum with the nose downward. The ejector fixture and pendulum were made adjustable to allow for proper alignment. An arresting device, consisting of two overriding clutches mounted on the TX-7 and riding on cables, was used to prevent backswing and allow for measurement of unit movement. A tape was used to measure the chord distance by which the unit was displaced when ejected.

The first group of tests was performed in dynamic jig No. 1. This group consisted of tests using the Mc Lean air piston ejector with the ejector foot in two different positions on the ejector bar, tests using the Douglas cartridge type ejector, and tests using the Republic air piston ejector. An inoperative fuze was used in the TX-7 during these tests. The second group of tests was performed in dynamic jig No. 2, using the Mc Lean and the Douglas cartridge type ejectors on a TX-7 which contained a live fuze.

RESULTS

The results of this series of dynamic ejector performance tests can best be discussed in terms of the three basic types of values determined:

1. Values giving the energy output of the various ejectors under varying conditions.

2. Values of the accelerations produced on the TX-7 when ejected by the various ejectors.

3. Values of the stress produced in the TX-7 when ejected by the various ejectors.

The energy output of the various ejectors was determined as follows:

The TX-7, hanging vertically with the nose down in the tower pendulum, was swung through a circular arc under the impulse of the ejection. The chord length of the arc was measured, and from this measurement, the vertical displacement of the unit was computed. The energy output of the ejector was then taken as the potential energy gain of the TX-7 (the product of the weight and vertical displacement of the TX-7). Chord lengths, vertical displacements, and computed values of energy output are tabulated in Table II.

Figure 5 shows the energy output of various ejectors plotted versus per cent charge, or charging pressure in the case of the air piston type ejector. All the air piston type ejectors were tested in dynamic jig No. 1. The Douglas cartridge type ejector was tested in dynamic jig No. 1, with the full charge test being repeated in dynamic jig No. 2. The Mc Lean cartridge type ejector was tested in dynamic jig No. 2. From the results of the tests conducted on the Douglas cartridge type ejector in both jigs Nos. 1 and 2, it was concluded that of the total energy released by the ejector, more is absorbed by friction in jig No. 2 than in jig No. 1. To compare the energy output of the Mc Lean cartridge type ejector (tested in jig No. 2) with the energy output of the other ejectors, (tested in jig No. 1) the following correction was made: The difference between the energy output of the Douglas cartridge type ejector when tested in jig No. 1 and when tested in jig No. 2 was taken as the difference between the resistance to swing offered by the two jigs. This difference was added to the energy output of the Mc Lean cartridge type ejector, as computed from chord lengths measured during the tests in jig No. 2.

At maximum energy output the durations of the ejector power strokes were as follows: Douglas cartridge type, 0.065 second; Mc Lean air piston type, 0.101 second; Republic air piston type, 0.134 second; Mc Lean cartridge type, no orifice, 0.176 second; Mc Lean cartridge type, 0.062 inch diameter orifice, 0.177 second; and Mc Lean cartridge type, 0.081 inch diameter orifice, 0.196 second. For each of the ejectors the duration of the power stroke decreased as the amount of charge, or charge pressure, increased. The duration of the power stroke of the ejectors is plotted versus per cent of charge, or charging pressure in the case of the air piston type ejectors, in Fig. 6.

The accelerations produced at various points on the TX-7 when used with the ejectors are tabulated in Table III. The accelerations for each type of ejector are plotted versus per cent of charge, or charging pressure, in Figs. 7 through 11. In addition to the effect of per cent of charge, or charging pressure, on accelerations, these figures serve to point up the difference between accelerations at various points on the TX-7. Figure 12 provides for a comparison of the maximum accelerations produced by the ejectors tested.

The stresses and deflections produced in the TX-7 during ejection are tabulated in Table IV.

Figures 13 through 22 are samples of the records taken during the ejector tests.

J. H. Atkinson
J. H. ATKINSON - 1532-2

R. C. Dove
R. C. DOVE - 1532-1

JHA:1532:hh

B. W. Duggin
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DISTRIBUTION:
1/21A - 15/21A - C. F. Robinson - 1243
16/21A - L. J. Paddison - 1500
17/21A - T. B. Morse - 1530 [redacted]
18/21A - G. H. Roth - 1520
19/21A - A. F. Cone - 1510
20/21A - F. J. Given - 5300
21/21A - J. M. Ralls - 1521-4
Attn: 1500 Drawing File

Approved by: P. H. Adams
P. H. ADAMS - 1532

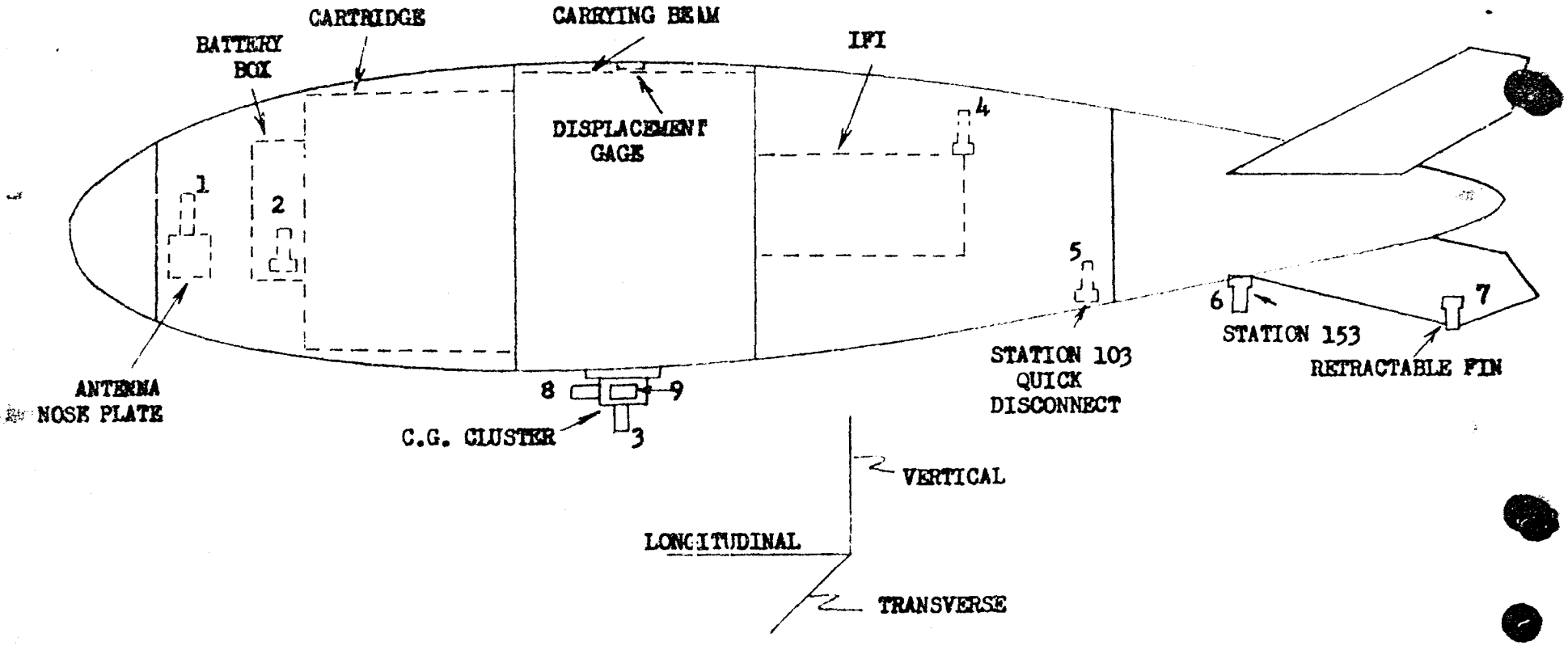

FIG. 1 - LOCATION OF ACCELEROMETERS, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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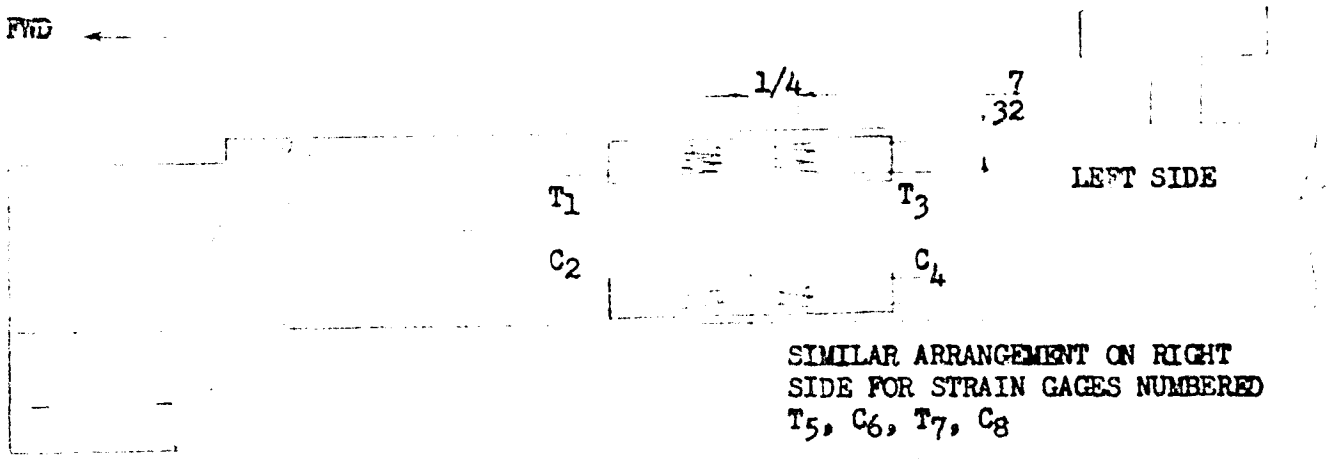
NOTE: GAGES ARE SR-4, TYPE A-8



GAGE CIRCUIT NO. 9

(Similar circuit, No. 10, for gages on right side of beam)

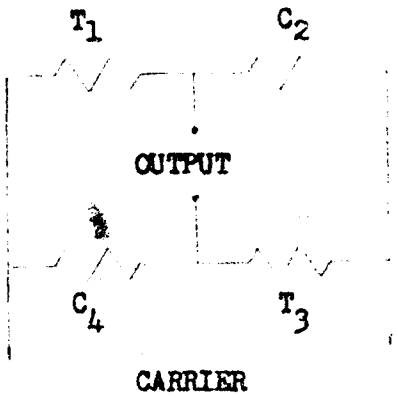


FIG. 2 - STEEL CARRYING BEAM SHOWING STRAIN GAGES AND LOCATIONS, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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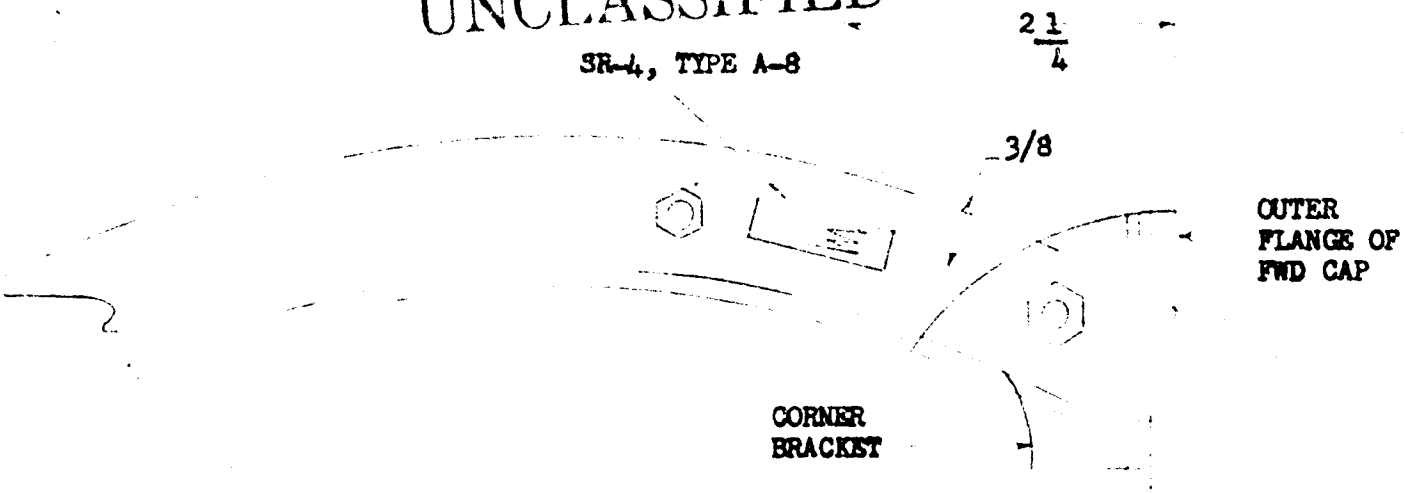
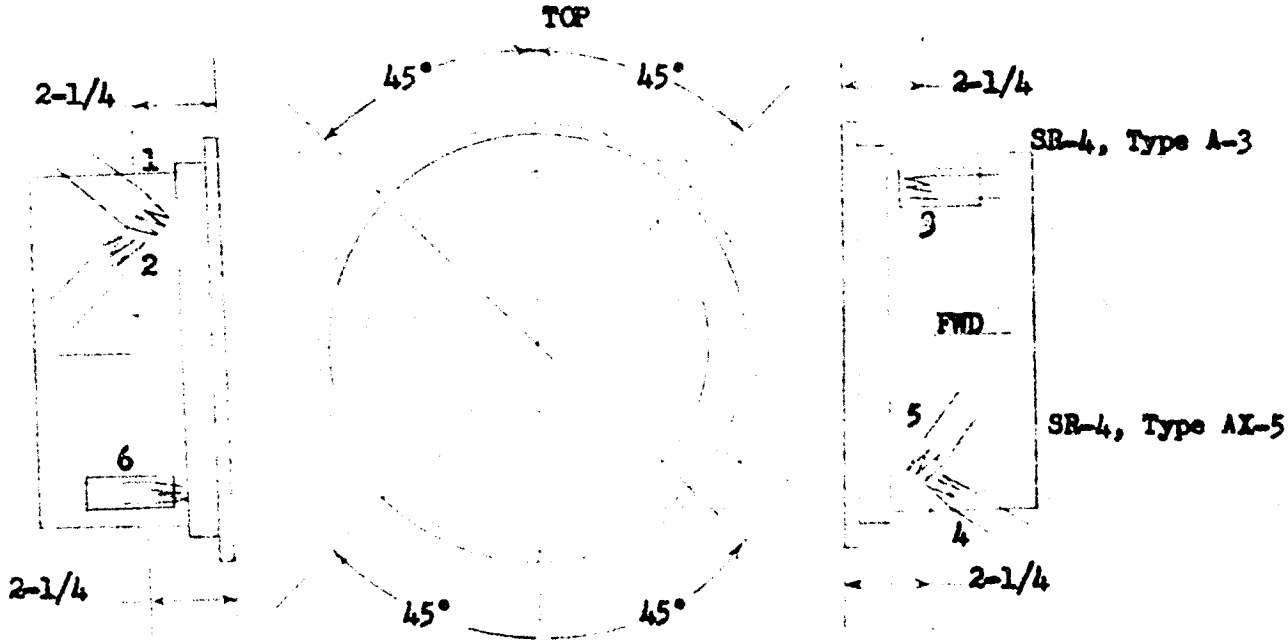


SPACE CHAMBER SHOWING STRAIN GAGES ON THREE SEGMENT FLANGES
(F_1 - Top left flange, F_2 - Top right flange, F_3 - Bottom flange)



CARTRIDGE MOUNTING RING SHOWING TENSION AND SHEAR GAGES

FIG. - 3 - STRAIN GAGE LOCATIONS, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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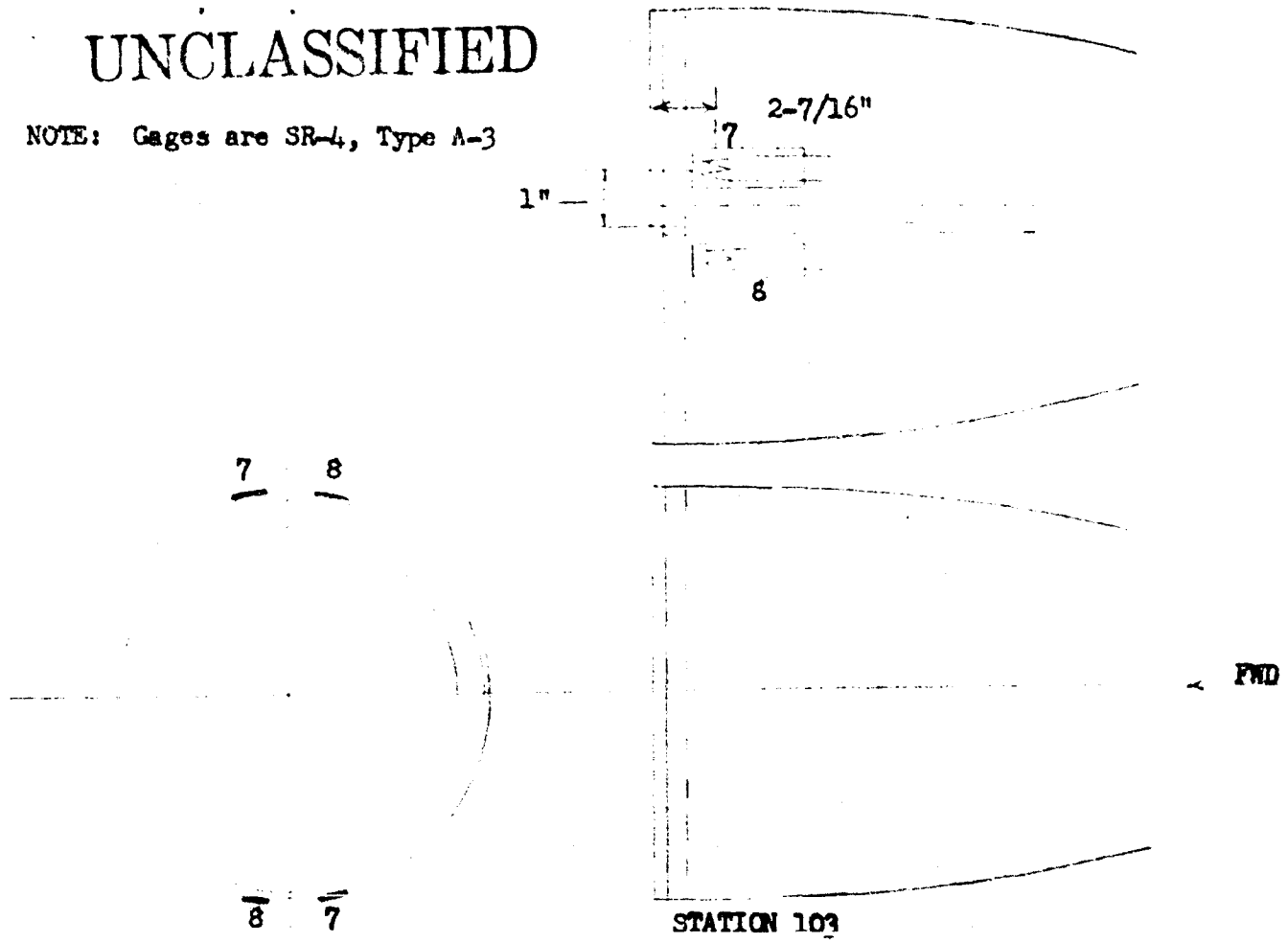
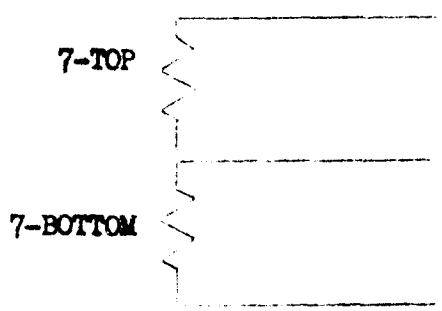
NOTE: Gages are SR-4, Type A-3





TWO ARM BRIDGE

GAGE CIRCUIT:

(Similar circuit for Gages 8-top and 8-bottom)

FIG. 4 - AFT ASSEMBLY SHOWING LOCATION OF STRAIN GAGES - DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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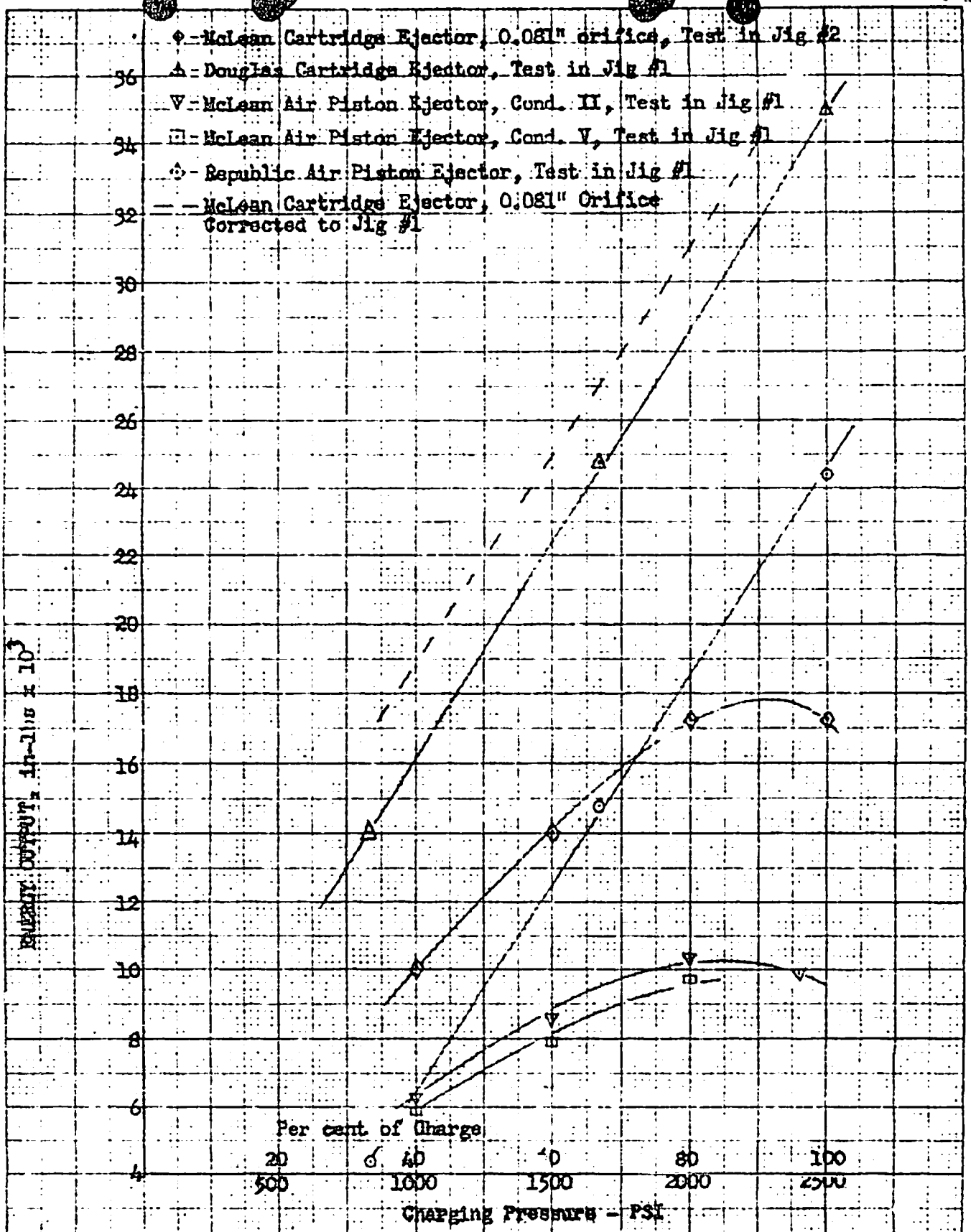

FIG. 5 - EJECTOR ENERGY OUTPUT, DYNAMIC EJECTOR PERFORMANCE TESTS OF TX-7

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Project No. TM-59

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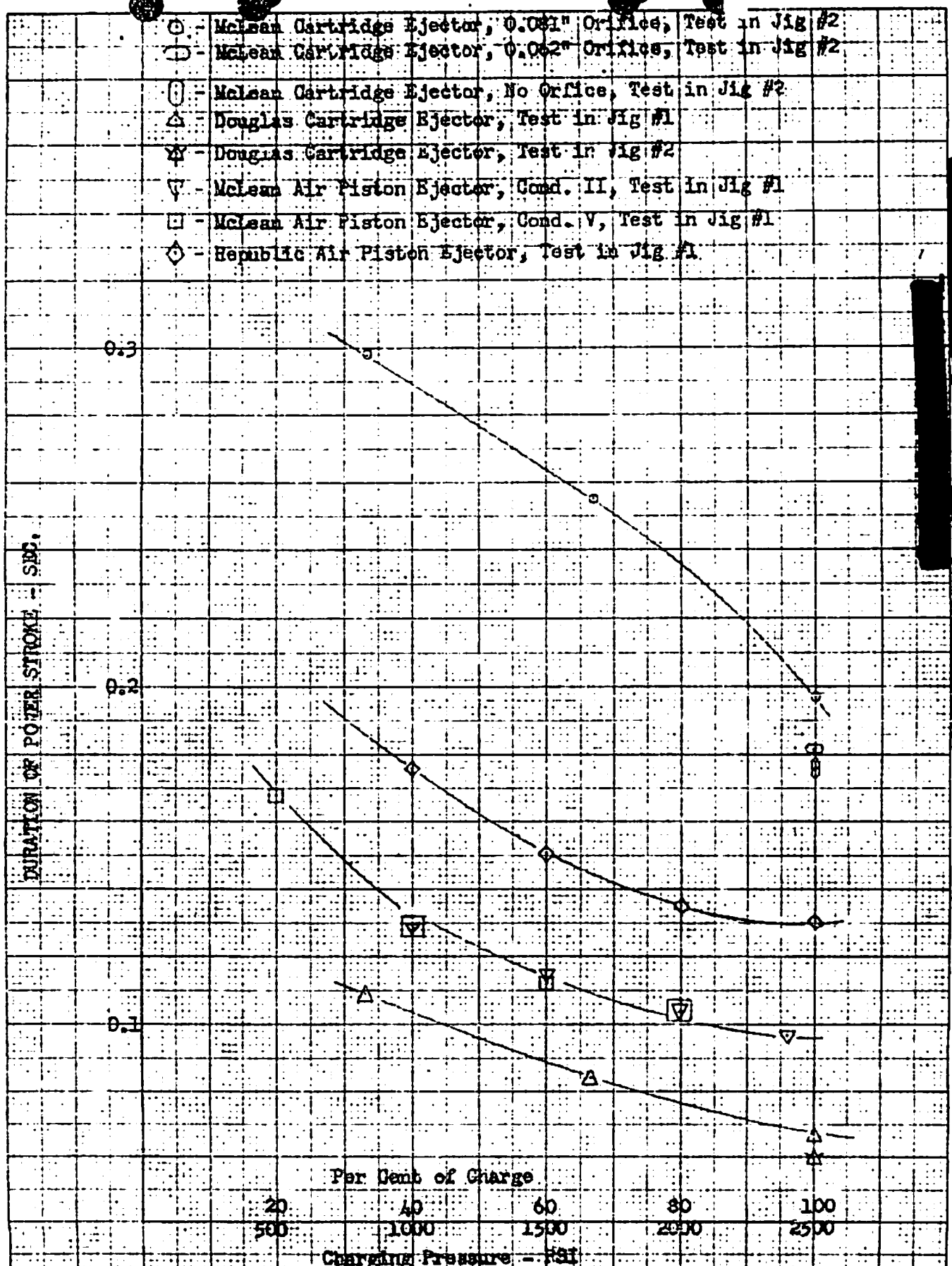

FIG. 6 - DURATION OF POWER STROKE, DYNAMIC EJECTOR PERFORMANCE TESTS

Ref. Symbol: 1532(31)
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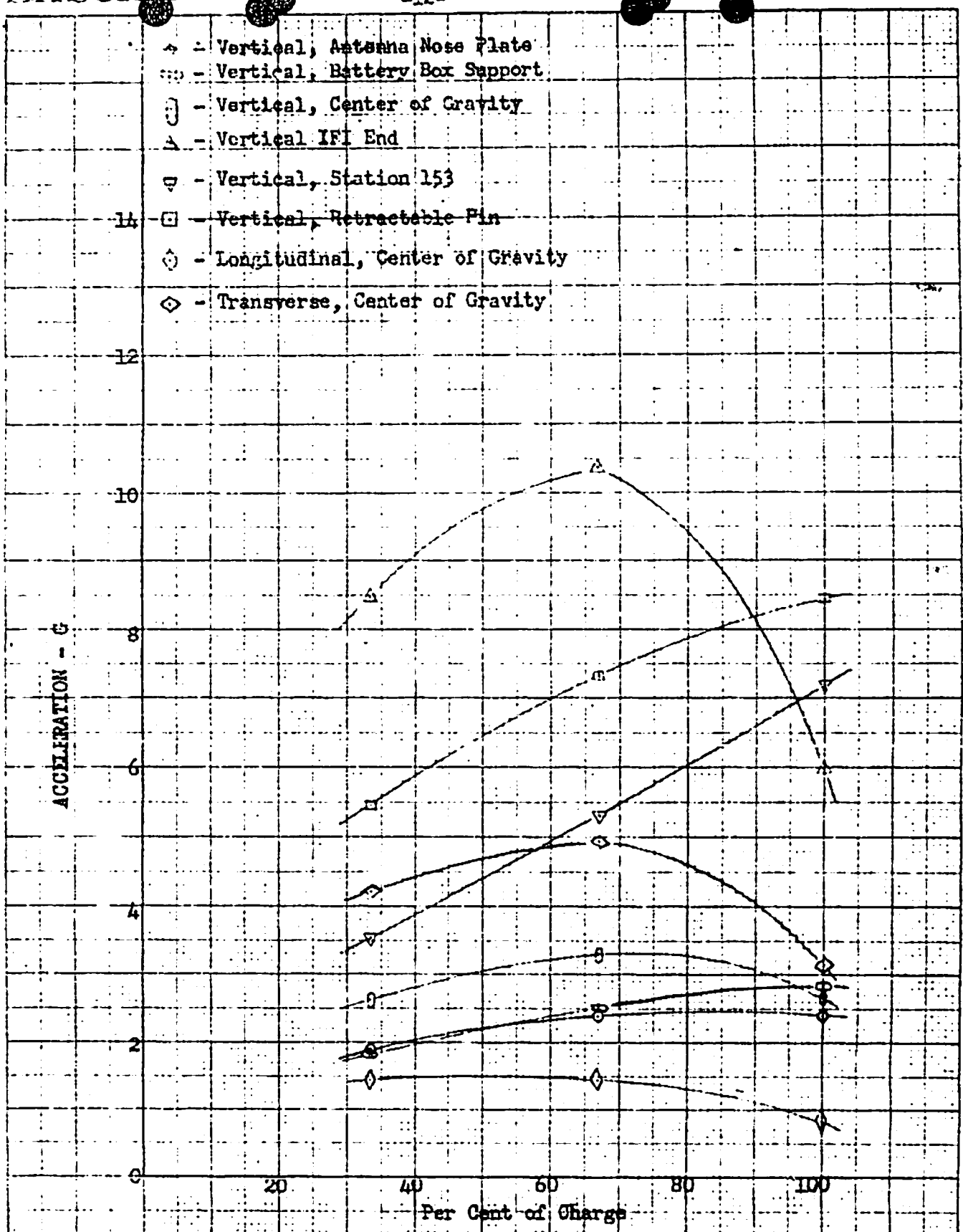

FIG. 7 - ACCELERATION PRODUCED BY MC LEAN CARTRIDGE TYPE EJECTOR (0.081" ORIFICE) DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

Ref. Symbol:1532(31)
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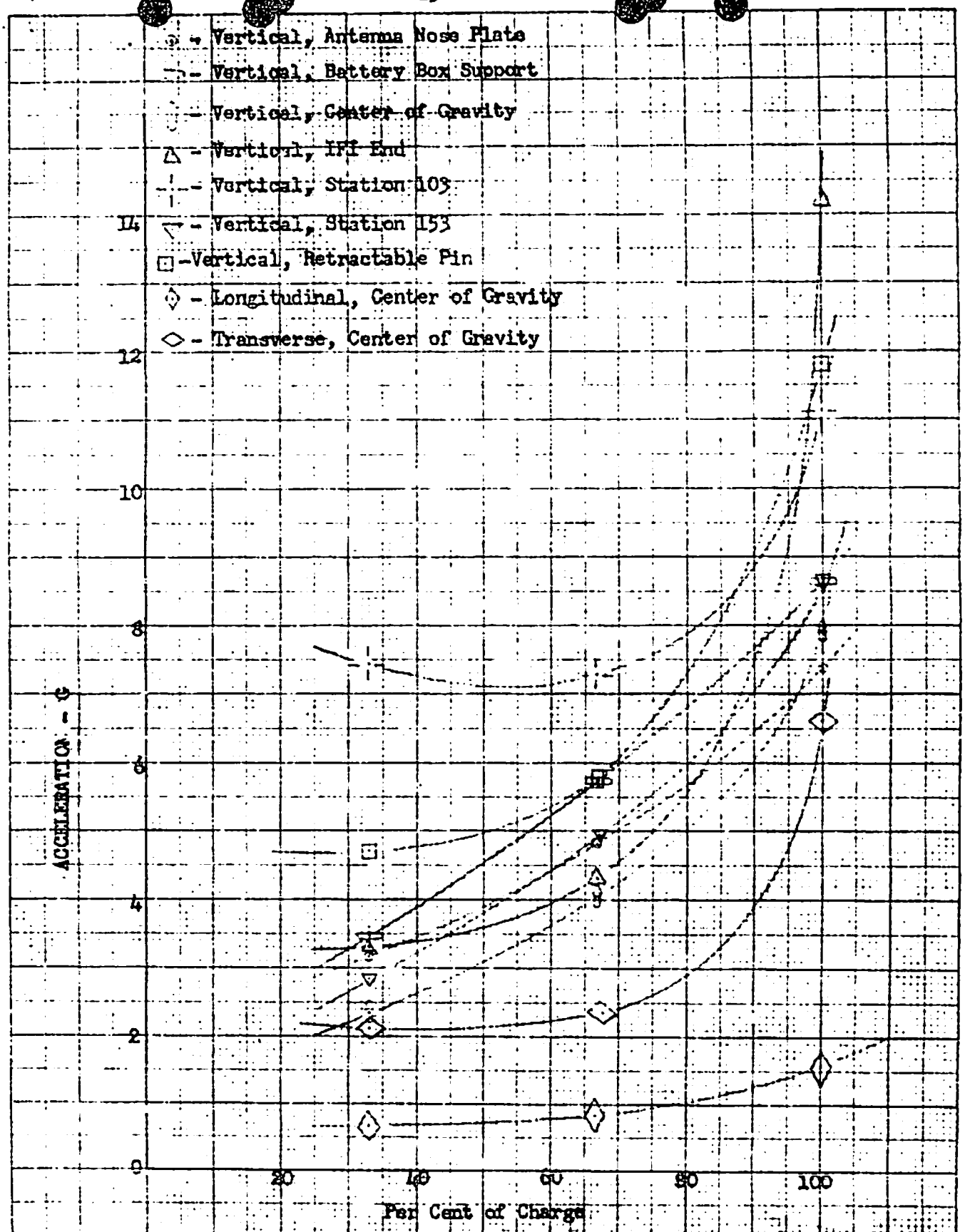

FIG. 8 - ACCELERATION PRODUCED BY DOUGLAS CARTRIDGE TYPE EJECTOR [redacted] DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7 [redacted]

Ref. Symbol: 1532 (31)
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[redacted]

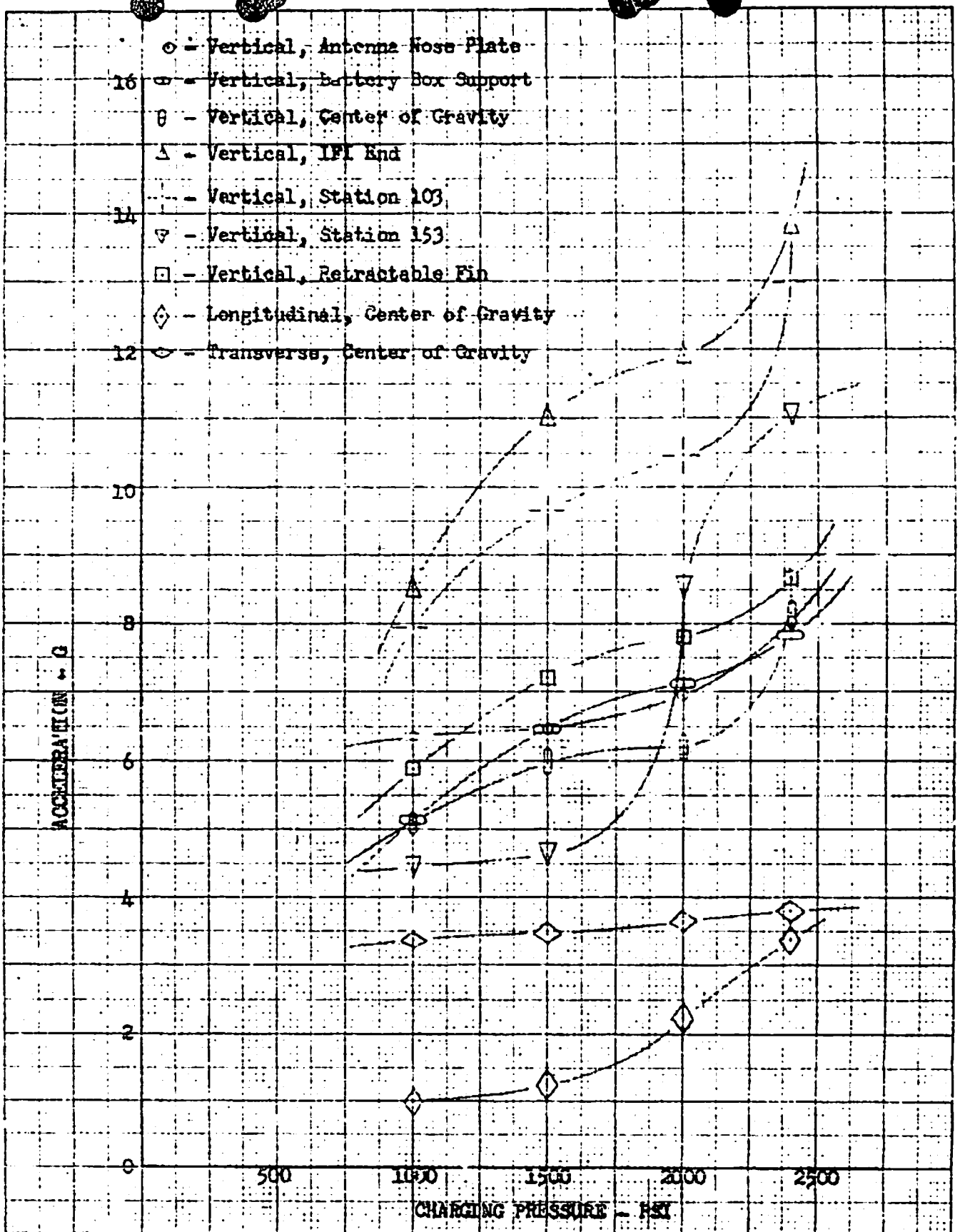

FIG. 9 - ACCELERATION PRODUCED .. MC DEAN AIR PISTON TYPE EJECTOR, CONDITION II - DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-2

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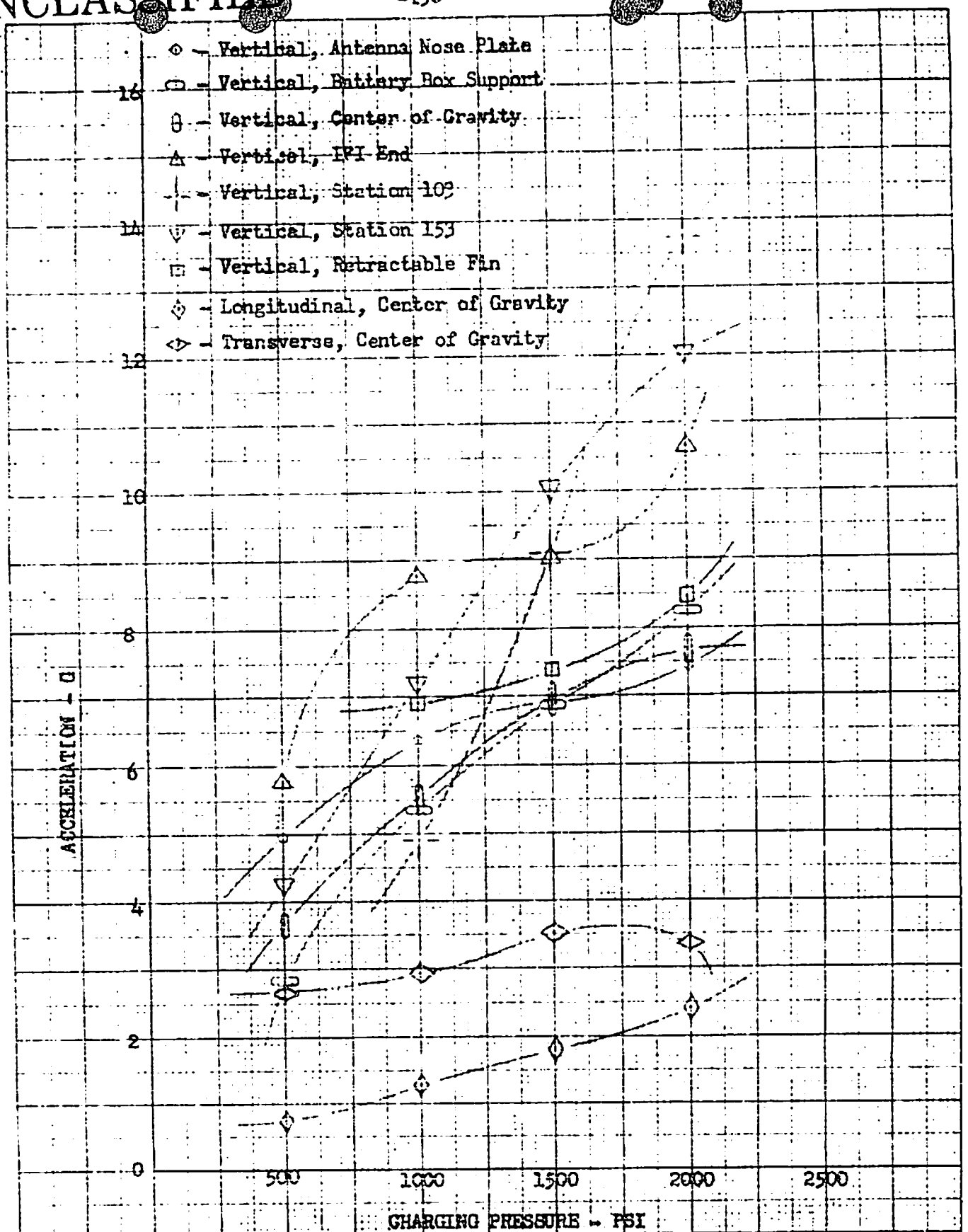


FIG. 10 - ACCELERATION PRODUCED BY MC LEAN AIR PISTON TYPE EJECTOR, CONDITION V - DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

[redacted]

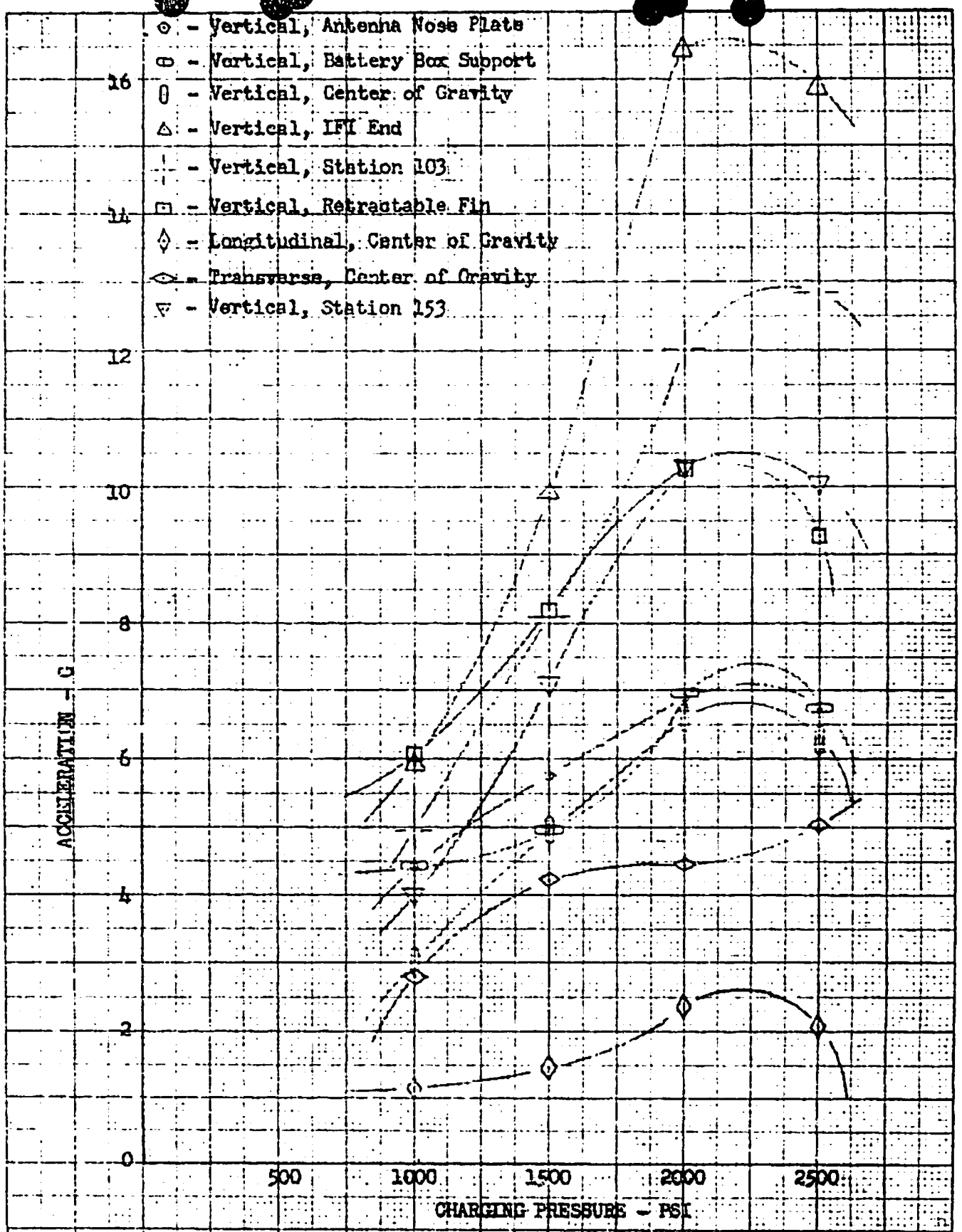
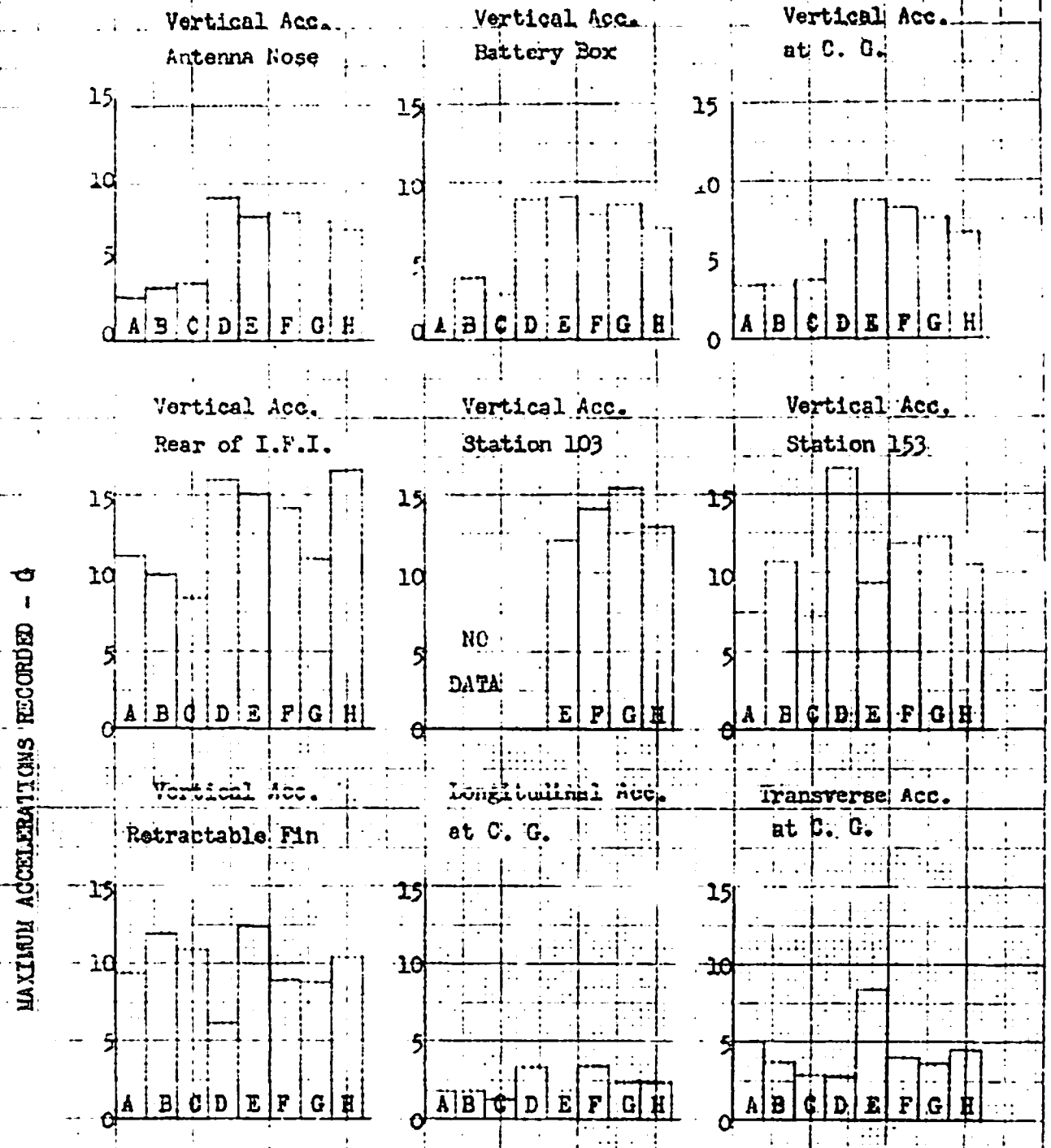


FIG. 11 - ACCELERATION PRODUCED BY REPUBLIC AIR PISTON EJECTOR - DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7



Legend:
A - Mc Lean cartridge 0.081 inch orifice
B - Mc Lean cartridge 0.062 inch orifice
C - Mc Lean cartridge, no orifice
D - Douglas cartridge, Jig No. 2
E - Douglas cartridge, Jig No. 1
F - Mc Lean air piston, Cond. II
G - Mc Lean air piston, Cond. V
H - Republic air piston

FIG 12 - MAXIMUM ACCELERATIONS, DYNAMIC EJECTOR PERFORMANCE TEST OF THE FX-7

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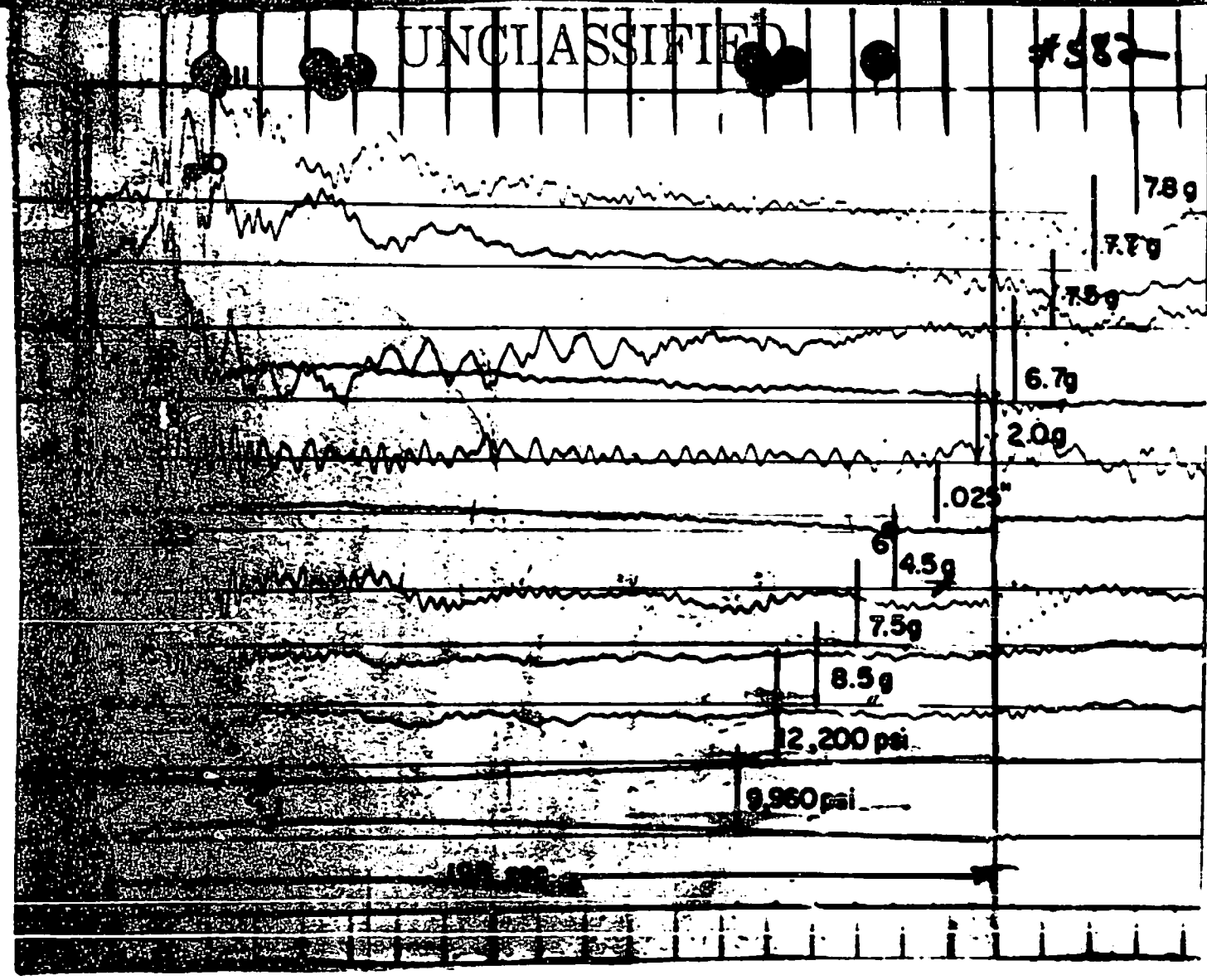
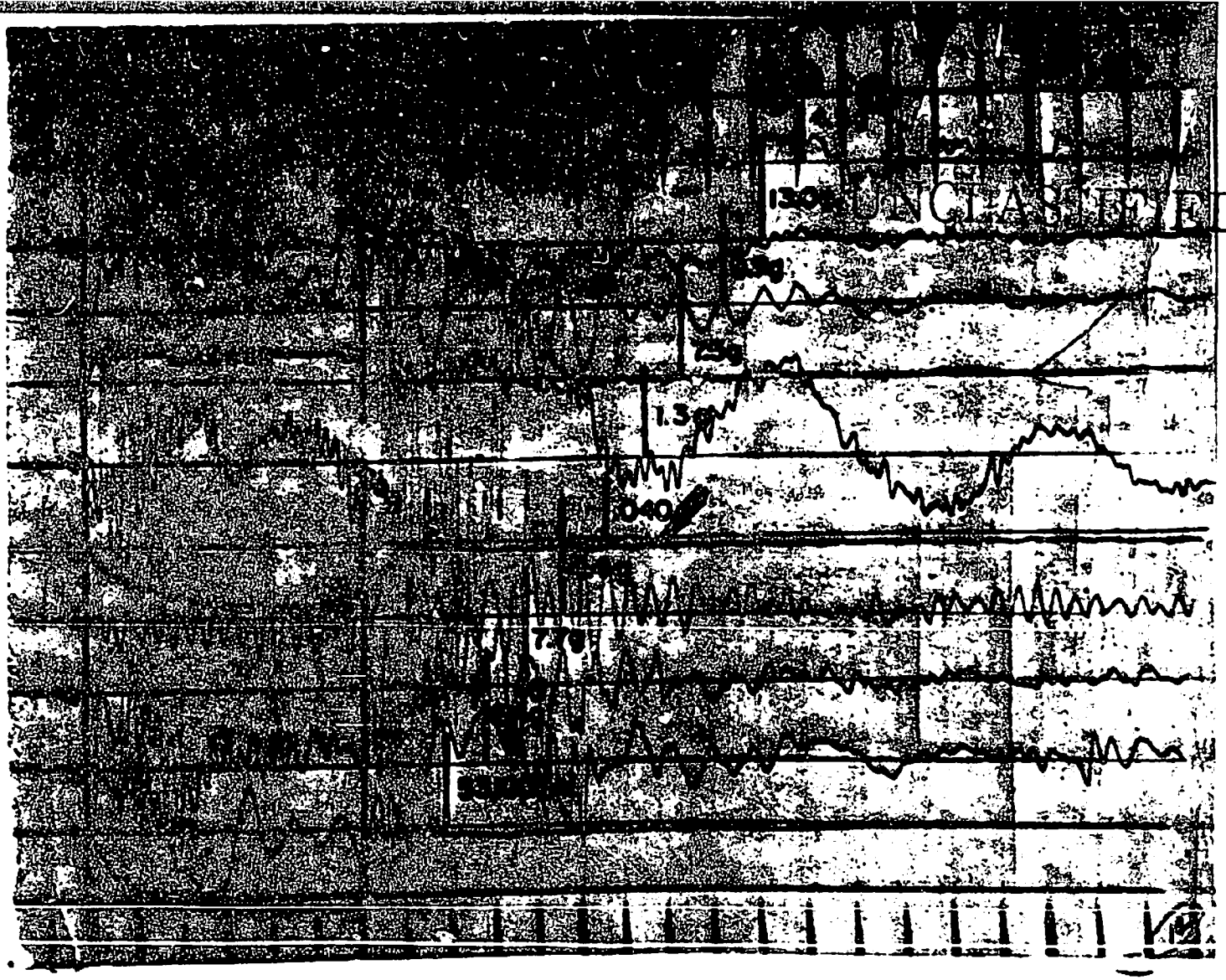


Record taken during test of the Mc Lean cartridge type ejector; Run 1, full powder charge, 0.031" diameter orifice. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gages - T_1, C_2, T_3, C_4
2	Strain gages - T_5, C_6, T_7, C_8
3	Accelerometer No. 1
4	Accelerometer No. 2
5	Accelerometer No. 9
6	Displacement gage
7	Accelerometer No. 8
8	Accelerometer No. 3
9	Accelerometer No. 4
10	Accelerometer No. 6
11	Accelerometer No. 7

FIG. 13 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7



Record taken during test of the Douglas cartridge type ejector; Run 1, full powder charge, tested in dynamic jig No. 2. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gages - T_1, C_2, T_3, C_4
3	Accelerometer No. 1
4	Accelerometer No. 2
5	Accelerometer No. 9
6	Displacement gage
7	Accelerometer No. 8
8	Accelerometer No. 3
9	Accelerometer No. 4
10	Accelerometer No. 6
11	Accelerometer No. 7

FIG. 14 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF TIB. TX-7

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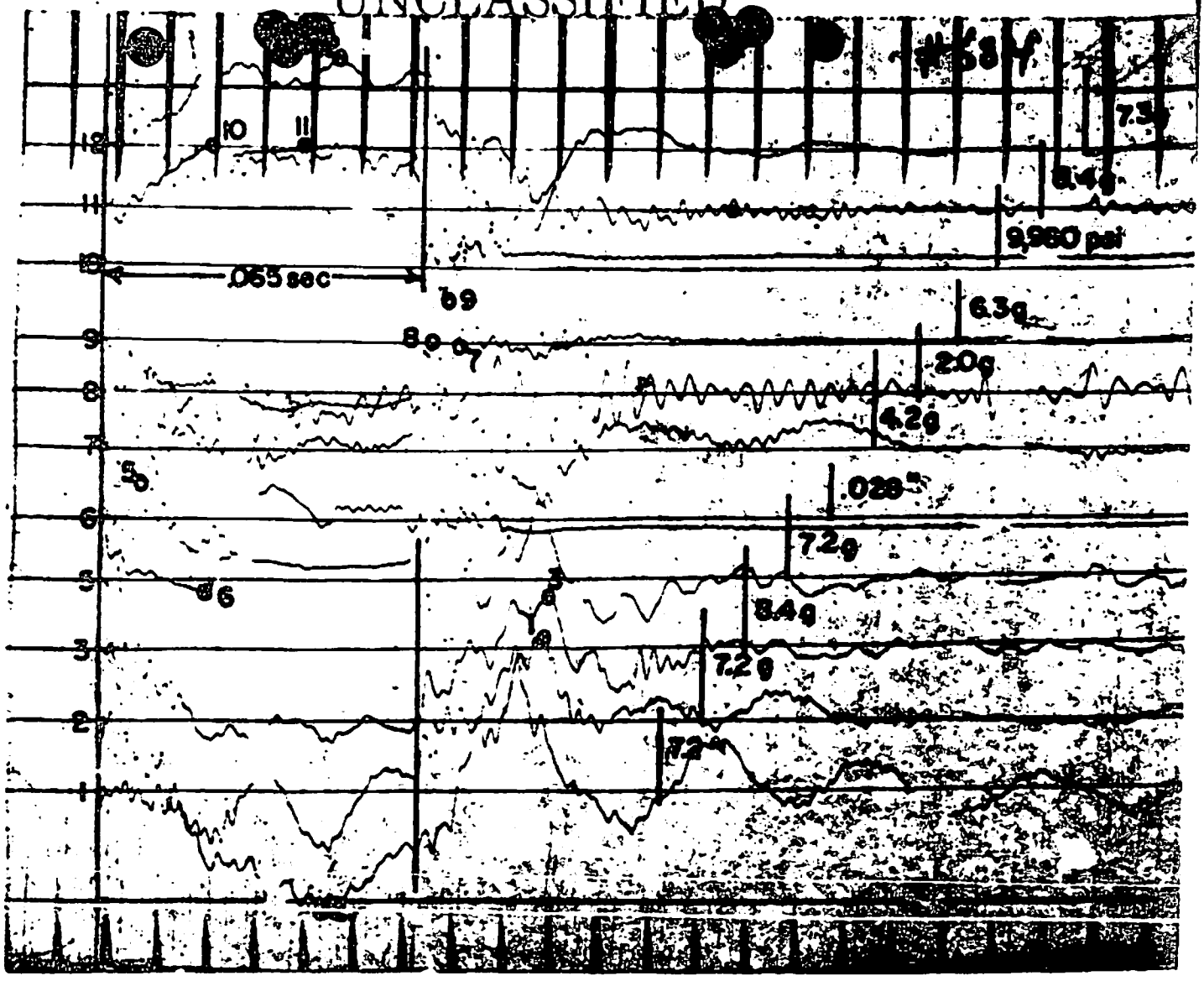

Record taken during test of the Douglas cartridge type ejector; Run 2, full powder charge, tested in dynamic jig No. 1. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Accelerometer No. 7
2	Accelerometer No. 6
3	Accelerometer No. 5
5	Accelerometer No. 4
6	Displacement gage
7	Accelerometer No. 9
8	Accelerometer No. 8
9	Accelerometer No. 3
10	Strain gages - T_1, C_2, T_3, C_4
11	Accelerometer No. 2
12	Accelerometer No. 1

FIG. 15 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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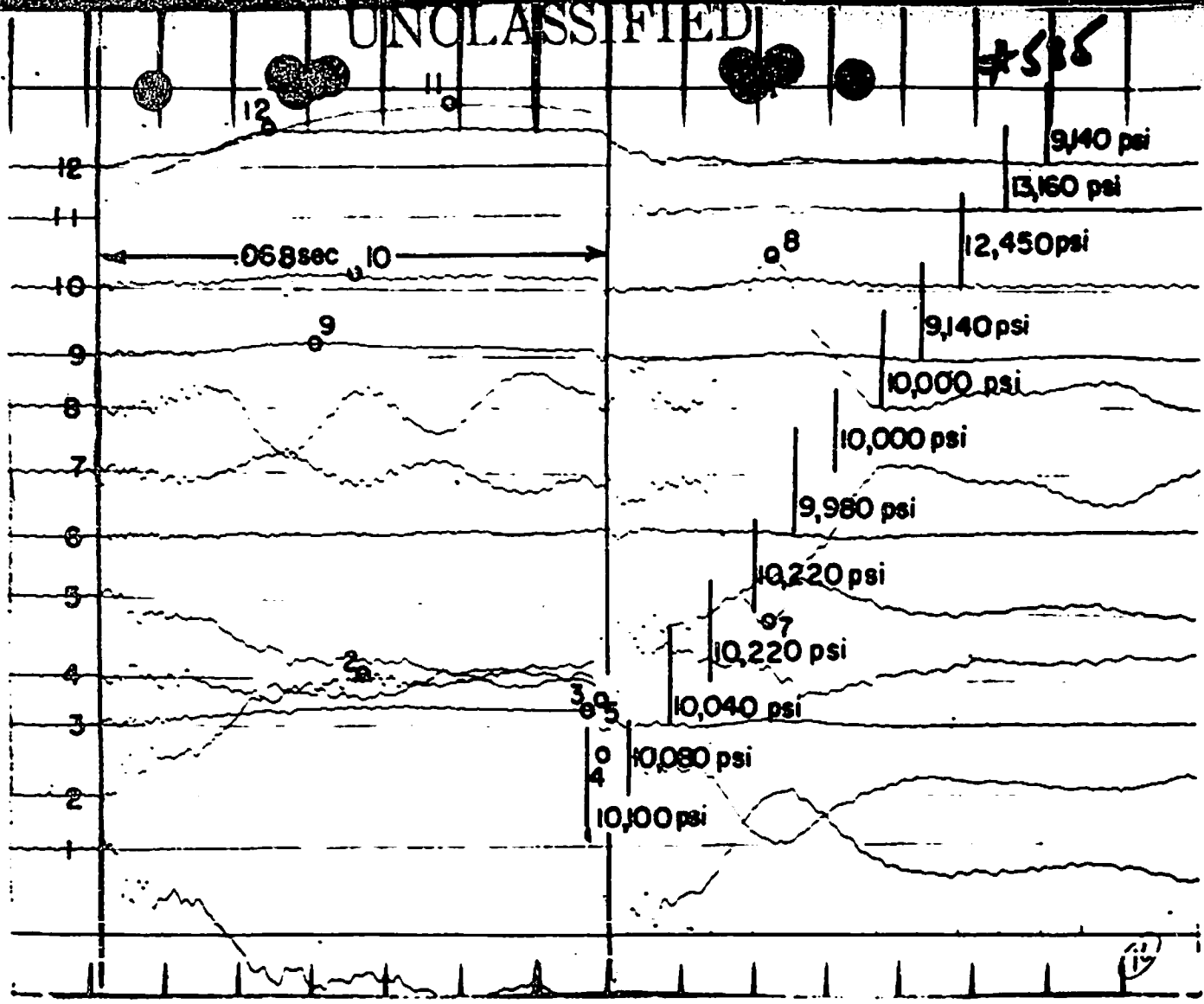

Record taken during test of the Douglas cartridge type ejector; Run 2, full powder charge, tested in dynamic jig No. 1. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gage No. 1
2	Strain gage No. 2
3	Strain gage No. 3
4	Strain gage No. 4
5	Strain gage No. 5
6	Strain gage No. 6
7	Strain gages No. 7
8	Strain gages No. 8
9	Strain gage F_1
10	Strain gage F_2
11	Strain gages T_5, C_6, T_7, C_8
12	Strain gage F_3

FIG. 16 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TM-7

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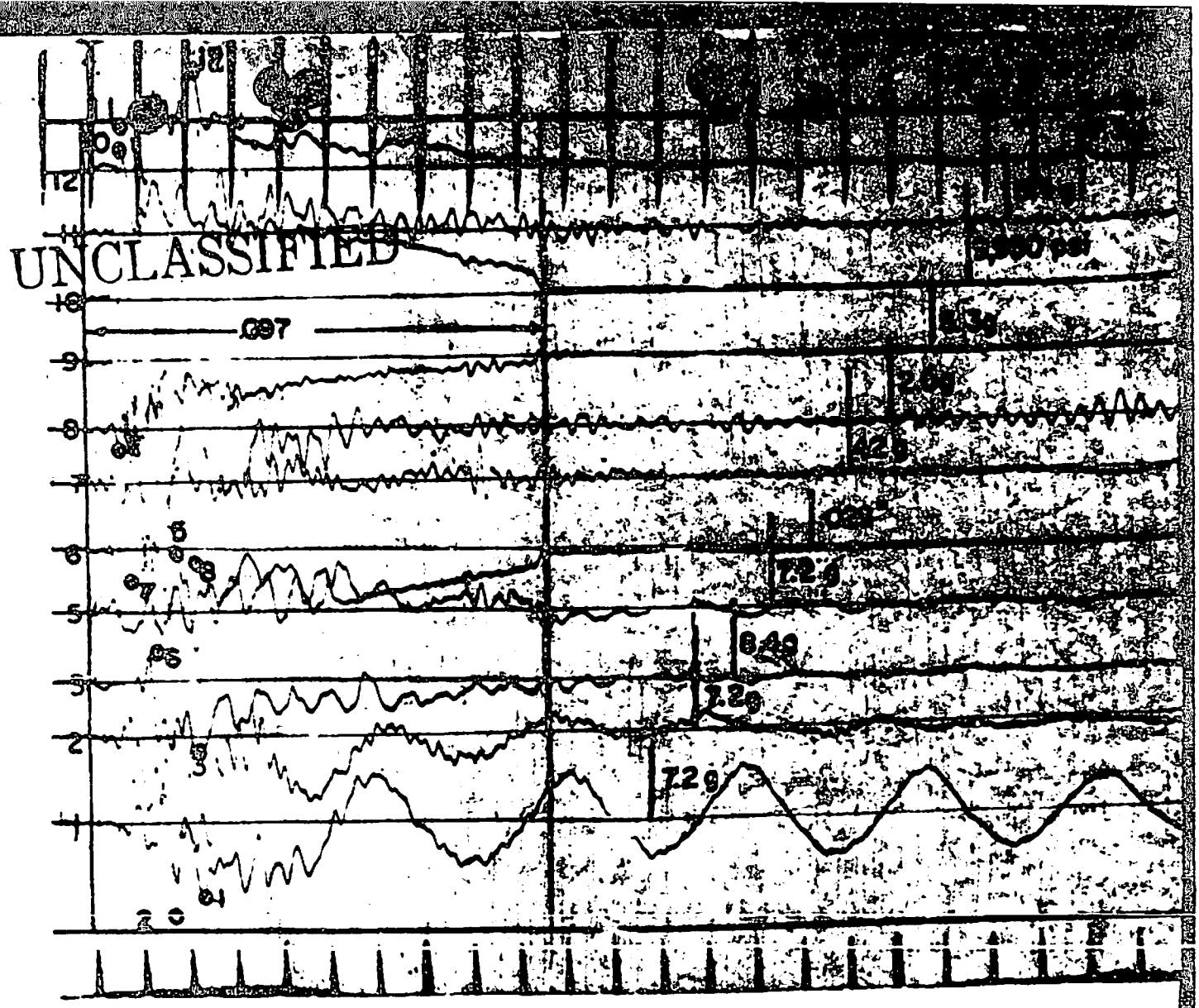

Record taken during test of the Mc Lean air piston type ejector; Condition II; Run 2, 2400 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Accelerometer No. 7
2	Accelerometer No. 6
3	Accelerometer No. 5
5	Accelerometer No. 4
6	Displacement gage
7	Accelerometer No. 9
8	Accelerometer No. 8
9	Accelerometer No. 3
10	Strain gages - T_1, C_2, T_3, C_4
11	Accelerometer No. 2
12	Accelerometer No. 1

FIG. 17 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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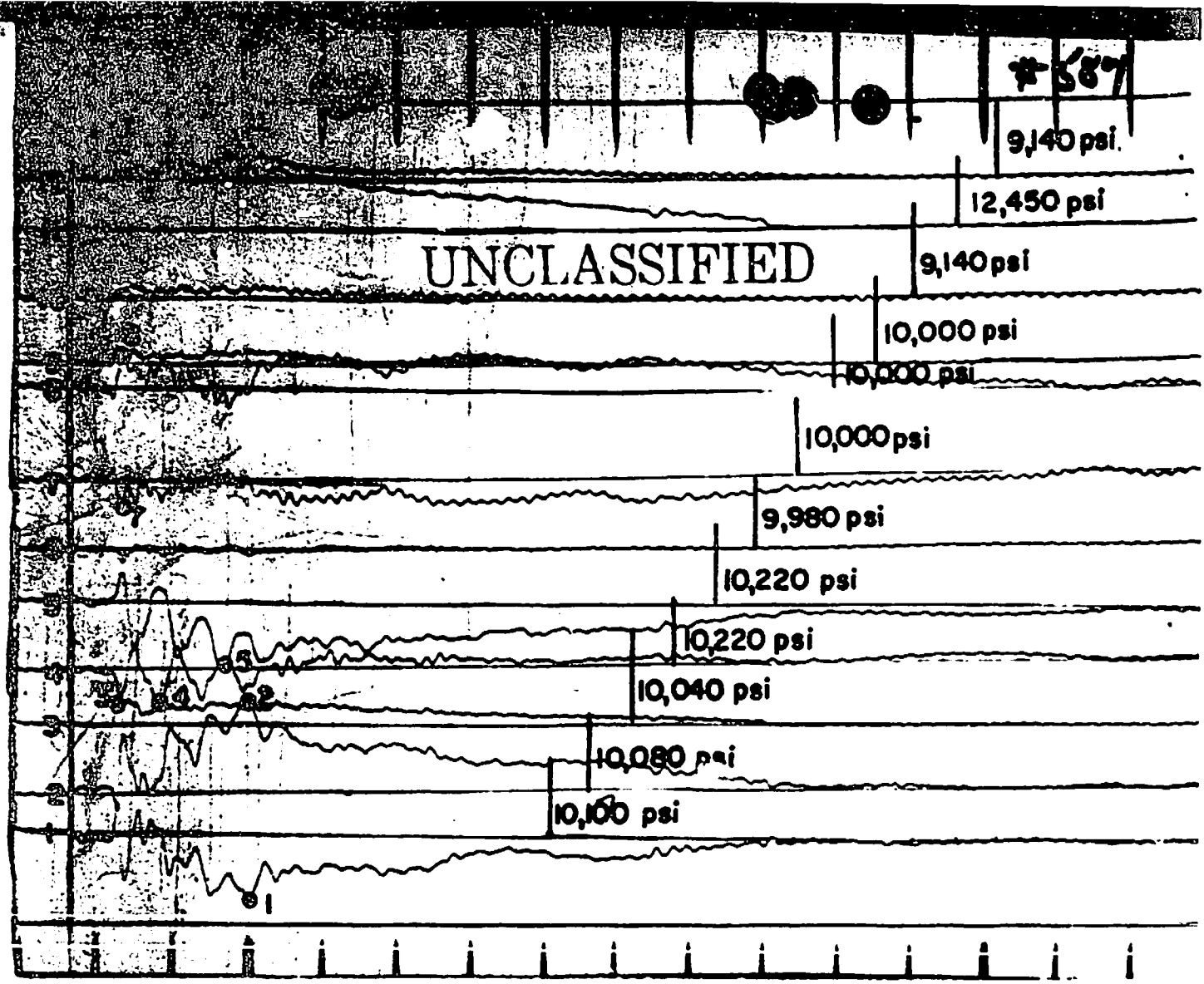

Record taken during test of the Mc Lean air piston type ejector, Condition II; Run 2, 2400 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gage No. 1
2	Strain gage No. 2
3	Strain gage No. 3
4	Strain gage No. 4
5	Strain gage No. 5
6	Strain gage No. 6
7	Strain gages No. 7
8	Strain gages No. 8
9	Strain gage F_1
10	Strain gage F_2
11	Strain gages - T_5, C_6, T_7, C_8
12	Strain gage - F_3

FIG. 18 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

Ref. Symbol: 1532 (31)
Project No. TH-59

[redacted]

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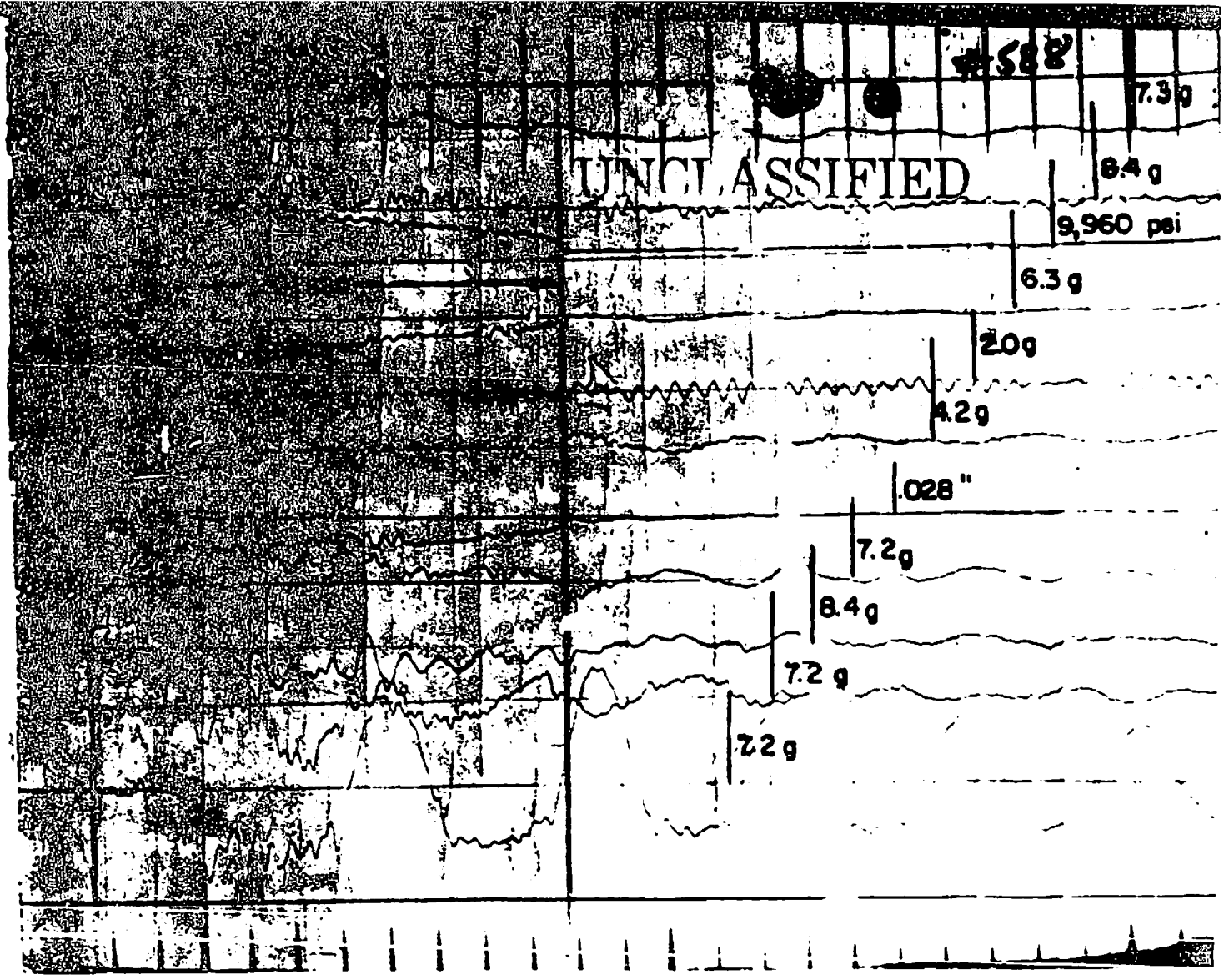

Record taken during test of the Mc Lean air piston type ejector, Condition V; Run 2, 2000 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Accelerometer No. 7
2	Accelerometer No. 6
3	Accelerometer No. 5
5	Accelerometer No. 4
6	Displacement gage
7	Accelerometer No. 9
8	Accelerometer No. 8
9	Accelerometer No. 3
10	Strain gages - T_1, S_2, T_3, S_4
11	Accelerometer No. 2
12	Accelerometer No. 1

FIG. 19 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF McL TX-7

Ref. Symbol: 1532 (31)
Project No. 7-59

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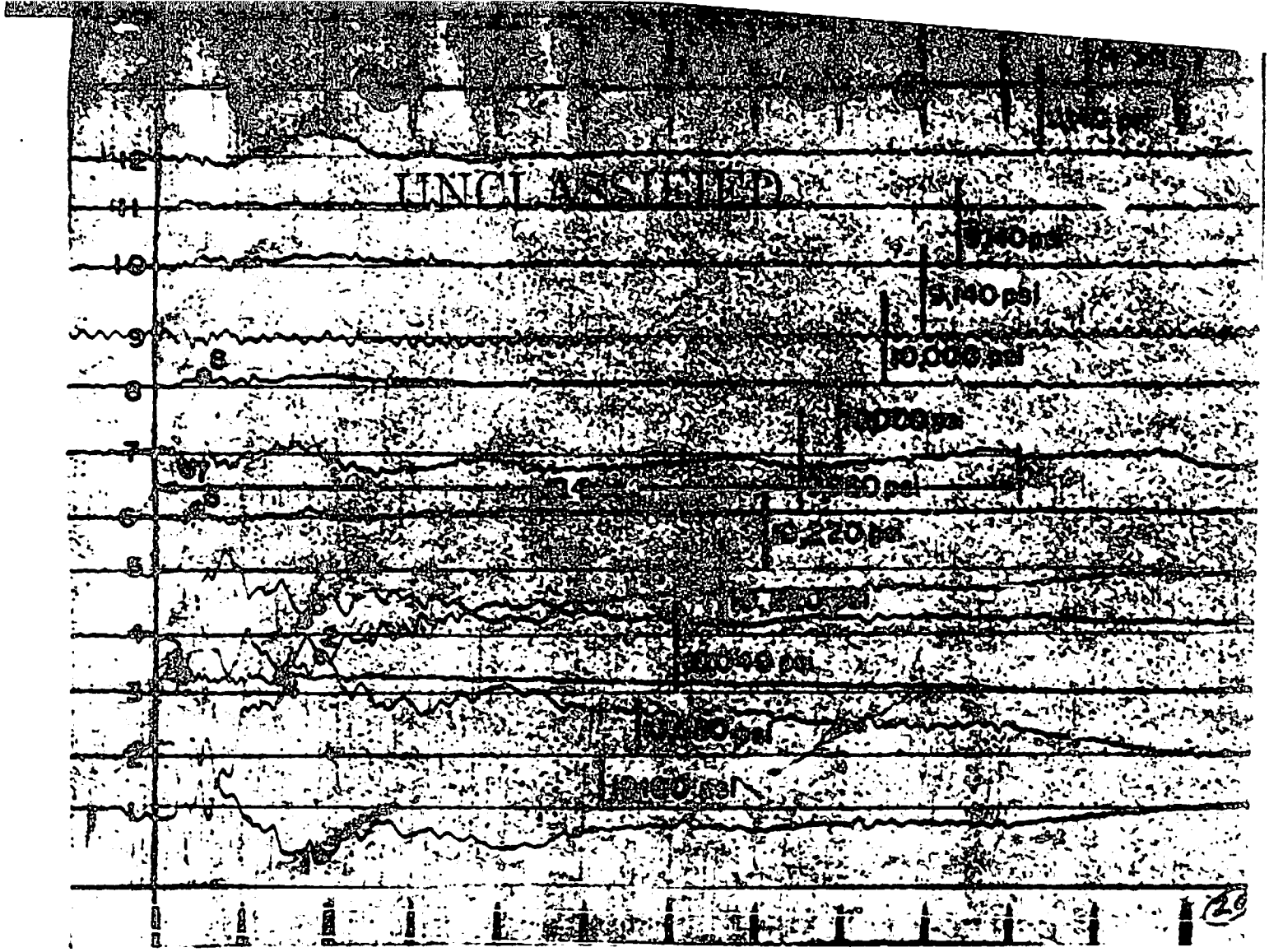

Record taken during test of the Mc Lean air piston type ejector, Condition V; Run 2, 2000 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gage No. 1
2	Strain gage No. 2
3	Strain gage No. 3
4	Strain gage No. 4
5	Strain gage No. 5
6	Strain gage No. 6
7	Strain gages No. 7
8	Strain gages No. 8
9	Strain gage - F_1
10	Strain gage - F_2
11	Strain gages - T_5, C_6, T_7, C_8
12	Strain gage F_3

FIG. 20 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

Ref. Symbol: 1532 (31)
Project No. TM-59

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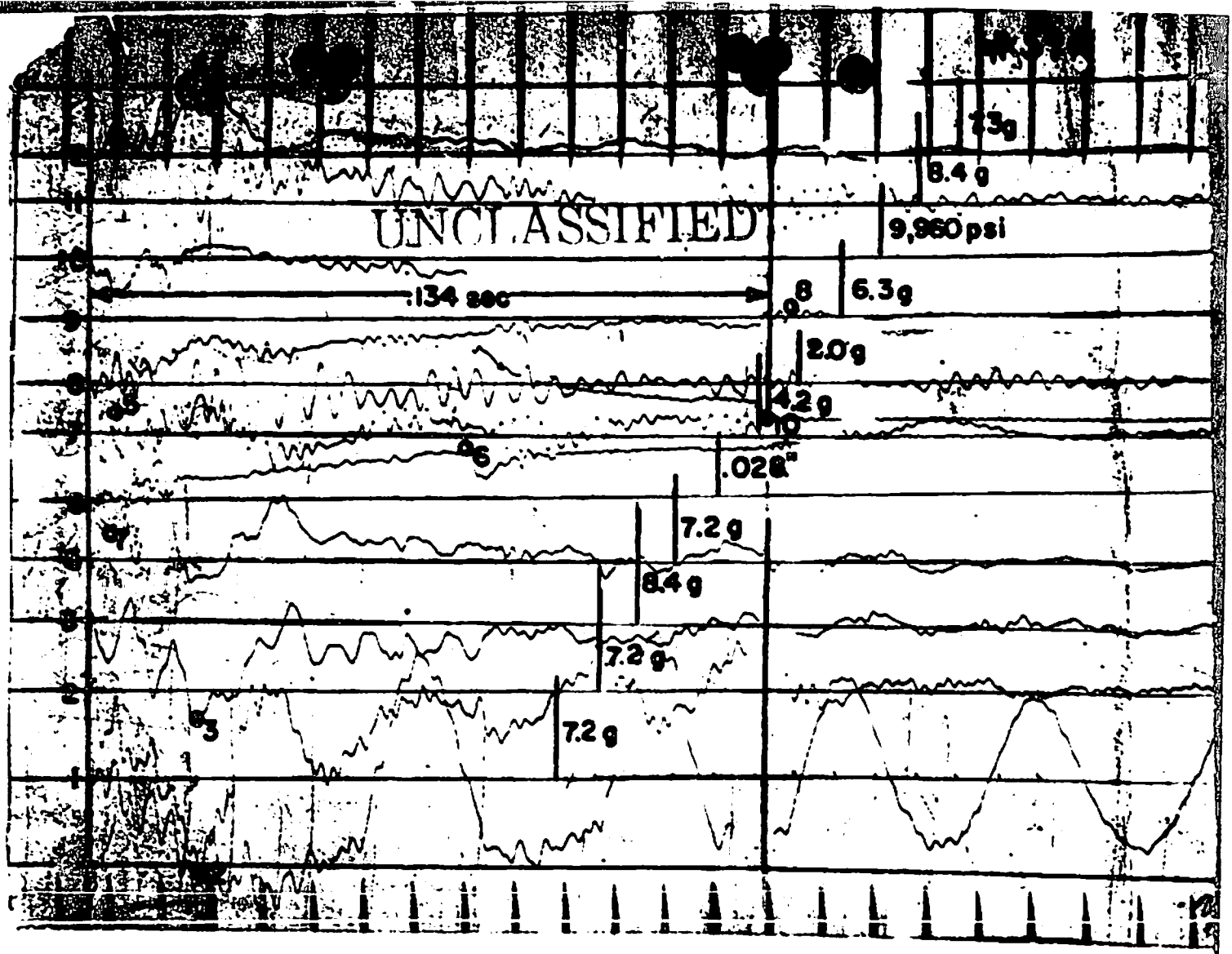

Record taken during test of the Republic air piston type ejector; Run 2, 2000 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read, measured span is duration of power stroke.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Accelerometer No. 7
2	Accelerometer No. 6
3	Accelerometer No. 5
5	Accelerometer No. 4
6	Displacement gage
7	Accelerometer No. 9
8	Accelerometer No. 8
9	Accelerometer No. 3
10	Strain gages - T_1, C_2, T_3, C_4
11	Accelerometer No. 2
12	Accelerometer No. 1

FIG. 21 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

Ref. Symbol: 1532 (31)
Project No. TM-59

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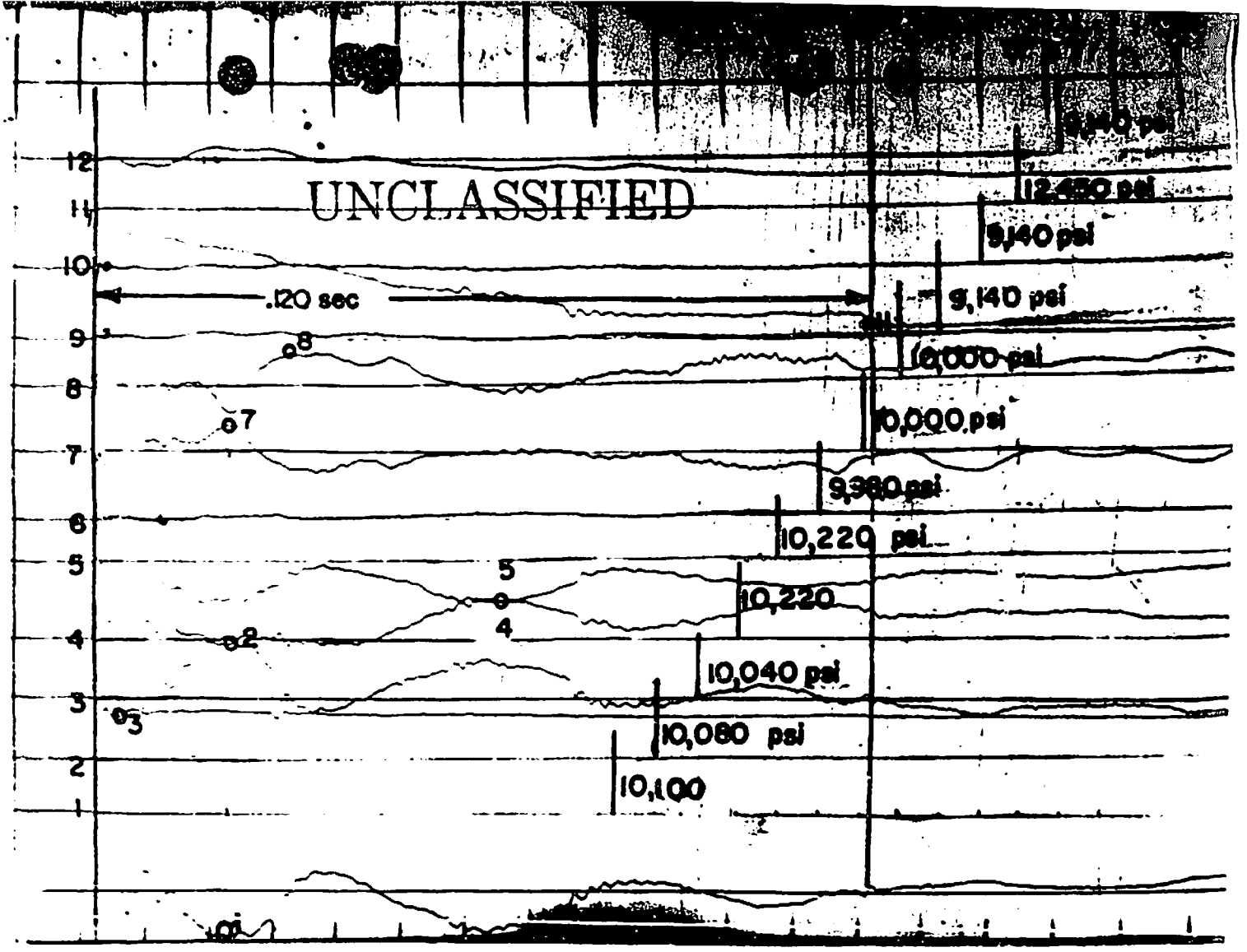

Record taken during test of the Republic air piston type ejector; Run 2, 2000 psi charging pressure. (Labeled vertical lines are calibrate values, circled points are trace peaks read.)

Record Trace No.	Displacement Gage, Accelerometer or Strain Gage No.
1	Strain gage No. 1
2	Strain gage No. 2
3	Strain gage No. 3
4	Strain gage No. 4
5	Strain gage No. 5
6	Strain gage No. 6
7	Strain gages No. 7
8	Strain gages No. 8
9	Strain gage - F_1
10	Strain gage - F_2
11	Strain gages - T_5, C_6, T_7, C_8
12	Strain gage - F_3

FIG. 22 - SAMPLE RECORD, DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

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TABLE I

ACCELEROMETERS, NUMBERS AND LOCATIONS -
DYNAMIC EJECTOR PERFORMANCE TEST OF THE TX-7

Accelerometer Ref. No.	Position and Location	Make, Model and Range	Serial No. Used During Tests Run in Dynamic Jig #1	Serial No. Used During Tests Run in Dynamic Jig #2
1	Vertical, Antenna Nose Plate (Inside)	Statham, Model No. A5A-~~100~~-300 ±50 g	522	522
2	Vertical, Battery Box Support (Inside Baffle)		637	514
3	Vertical, Center of Gravity		517	640
4	Vertical, IFI End		520	274
5	Vertical, Station 103 (Quick Disconnect)		635	- -
6	Vertical, Station 153		274	635
7	Vertical, Retractable Fin		638	636
8	Longitudinal, Center of Gravity		514	520
9	Transverse, Center of Gravity		636	637

TABLE II

EJECTOR ENERGY OUTPUT - DYNAMIC EJECTOR PERFORMANCE TESTS OT THE TX-7

I. McLean Cartridge Type Ejector (Test in jig #2)	C - Chord Length of Pendulum Swing (in)		h* - Vertical Displacement of TX-7 C.G. (in)		E** - Potential Energy Gain of TX-7 (in-lb)		
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Avg.
1/3 Chg .081 Orifice	34.75	no run	2.65	no run	4360	no run	4360
2/3 Chg .081 Orifice	66.5	61.25	9.7	8.25	16,000	13,600	14,800
Full Chg .081 Orifice	82.5	82.0	14.92	14.71	24,600	24,250	24,425
Full Chg .062 Orifice	84.5	82.5	15.65	14.92	25,800	24,600	25,200
Full Chg no Orifice	96.0	96.0	20.2	20.2	33,300	33,300	33,300
II. Douglas Cartridge Type Ejector							
1/3 Chg. Jig #1	61.25	63.25	8.24	8.79	13,560	14,480	14,020
2/3 Chg. Jig #1	79.75	85.50	13.97	16.06	23,020	26,460	24,740
Full Chg. Jig #1	96.75	99.75	20.56	21.86	33,890	36,020	34,955
Full Chg. Jig #2	80.0	78.0	14.06	13.36	23,170	22,020	22,595
III. McLean Air Piston Type Ejector Condition II							
1000 PSI Pressure	41.75	41.88	3.83	3.85	6310	6350	6330
1500 PSI Pressure	48.25	49.25	5.11	5.33	8430	8780	8605
2000 PSI Pressure	53.25	53.75	6.23	6.35	10,270	10,460	10,365
2400 PSI Pressure	51.0	53.5	5.71	6.28	9420	10,360	9890
IV. McLean Air Piston Type Ejector Condition V							
500 PSI Pressure	30.5	no run	2.04	no run	3370	no run	3370
1000 PSI Pressure	40.0	40.25	3.51	3.56	5790	5860	5825
1500 PSI Pressure	46.5	47.0	4.74	4.85	7830	7915	7915
2000 PSI Pressure	51.75	51.75	5.88	5.88	9690	9690	9690
V. Republic Air Piston Type Ejector							
1000 PSI Pressure	54.25	51.25	6.46	5.77	10,650	9510	10,080
1500 PSI Pressure	62.25	no run	8.51	no run	14,030	no run	14,030
2000 PSI Pressure	68.75	69.25	10.38	10.53	17,110	17,360	17,235
2500 PSI Pressure	69.0	no run	10.46	no run	17,240	no run	17,240

$$* \; h = \frac{C^2}{2 \times \text{pendulum length}} = \frac{C^2}{2 \times 227\text{-}5/8 \text{ inch}}$$

** E = Weight of TX-7 x h = 1645 h

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ACCELERATIONS PRODUCED - DYN

	1		2		3		
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run
I. Test of McLean Cartridge Type Ejector (Test in Jig #2)							
1/3 Charge (0.081" Orifice)	1.90	none	1.85	none	2.62	none	3.[illegible]
2/3 Charge (0.081" Orifice)	2.28	2.50	2.23	2.79	3.18	2.43	9.[illegible]
Full Charge (0.081" Orifice)	2.12	2.67	2.49	3.17	2.53	2.80	5.[illegible]
Full Charge (0.062" Orifice)	3.64	3.30	3.83	3.17	3.40	3.09	9.[illegible]
Full Charge (No Orifice)	3.57	2.98	2.87	2.89	3.22	3.72	7.[illegible]
II. Test of Douglas Cartridge Type Ejector							
1/3 Charge (Jig #1)	3.70	2.69	4.00	2.98	2.52	2.20	3.[illegible]
2/3 Charge (Jig #1)	5.51	4.12	6.79	4.72	4.31	3.77	5.[illegible]
Full Charge (Jig #1)	6.97	7.31	8.33	7.99	5.84	6.99	1[illegible]
Full Charge (Jig #2)	7.47	9.03	8.94	8.59	6.06	6.20	1[illegible]
III. Test of McLean Air Piston Type Ejector, Condition II							
1000 PSI Pressure	5.90	6.34	5.12	5.12	4.99	5.21	8.[illegible]
1500 PSI Pressure	6.42	6.51	6.40	6.52	6.03	5.93	1[illegible]
2000 PSI Pressure	7.41	6.51	7.15	7.07	6.74	6.17	11.[illegible]
2400 PSI Pressure	8.09	7.94	7.91	7.7[illegible]	8.08	[illegible]	1[illegible]
IV. Test of McLean Air Piston Type Ejector, Condition V							
500 PSI Pressure	4.95	none	2.83	none	3.67	none	[illegible]
1000 PSI Pressure	6.55	6.22	5.11	5.62	5.70	5.36	8.[illegible]
1500 PSI Pressure	7.19	6.64	6.95	6.83	7.41	6.52	9.[illegible]
2000 PSI Pressure	7.33	7.52	7.95	8.53	7.66	7.65	1[illegible]
V. Test of Republic Air Piston Type Ejector							
1000 PSI Pressure	4.38	4.44	4.50	4.33	3.66	2.97	6.[illegible]
1500 PSI Pressure	5.74	none	4.97	none	4.97	none	9.[illegible]
2000 PSI Pressure	6.85	6.93	6.89	6.99	6.60	6.62	16.[illegible]
2500 PSI Pressure	6.75	none	6.74	none	6.31	none	1[illegible]

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TABLE III

ACCELERATIONS PRODUCED - DYNAMIC EJECTOR PERFORMANCE TESTS OF THE TX-7

(acceleration - G)

Accelerometer Numbers

2		3		4		5		6	
Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
1.85	none	2.62	none	[illegible]	none	none	none	[illegible]	none
2.23	2.78	3.18	3.43	9.62	11.13	none	none	[illegible]	[illegible]
2.49	3.17	2.53	2.80	5.78	6.17	none	none	[illegible]	[illegible]
3.83	3.17	3.40	3.09	9.94	6.74	none	none	[illegible]	[illegible]
2.87	2.89	3.22	3.72	7.35	8.43	none	none	[illegible]	[illegible]
4.00	3.98	2.52	2.20	3.73	3.89	7.37	7.50	3.23	3.46
6.79	4.72	4.31	3.77	5.49	3.16	7.23	none	[illegible]	4.50
8.33	7.99	8.84	6.99	13.47	15.08	16.27	11.98	8.01	[illegible]
8.94	8.59	6.06	6.20	15.94	16.04	none	none	14.90	16.70
5.12	5.12	4.99	5.21	8.43	8.63	7.79	8.67	4.11	4.37
6.40	6.52	6.03	5.93	10.82	11.23	9.04	9.67	4.72	4.47
7.15	7.07	6.24	6.17	11.37	12.45	9.82	11.17	9.39	[illegible]
7.91	7.76	8.03	8.44	14.16	13.46	11.65	14.14	11.35	11.77
2.83	none	3.67	none	5.74	none	none	none	4.23	none
5.11	5.62	5.70	5.36	8.57	9.61	none	4.91	7.32	[illegible]
6.95	6.83	7.41	6.52	8.23	9.35	none	9.68	9.32	10.22
7.95	8.53	7.66	7.65	10.78	10.55	12.17	13.41	11.86	12.17
4.50	4.33	3.66	2.97	6.23	5.66	5.17	4.75	4.08	3.34
4.97	none	4.97	none	9.93	none	9.10	none	7.07	none
6.89	6.99	6.60	6.62	16.75	18.65	12.32	11.84	10.15	[illegible]
6.74	none	6.31	none	15.90	none	[illegible]	none	[illegible]	none

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: III

ECTOR PERFORMANCE TESTS OF THE TX-7

lleration - G)

ometer Numbers

	5		6		7		8		9	
n 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
ne	none	none	3.53	none	5.46	none	1.44	none	4.21	none
.13	none	none	5.30	5.32	7.09	7.57	1.12	1.75	5.01	4.87
17	none	none	6.84	7.53	7.47	9.40	0.61	1.02	2.92	2.68
74	none	none	10.60	6.51	11.08	9.87	1.77	0.96	3.69	2.55
43	none	none	7.25	7.08	10.80	8.92	1.17	1.14	2.79	2.21
89	7.37	7.50	3.23	2.46	6.39	3.02	0.91	0.48	2.83	1.41
16	7.28	none	5.39	4.50	6.55	4.98	1.01	0.64	2.39	2.37
.08	10.27	11.98	8.01	9.27	11.24	12.40	1.38	1.20	4.63	8.40
.04	none	none	14.80	16.70	5.46	6.12	3.35	3.10	2.78	1.73
63	7.79	8.07	4.11	4.77	5.68	6.10	0.93	1.09	3.42	3.32
.23	9.64	9.67	4.78	4.47	7.29	7.12	1.31	1.16	3.52	3.40
.45	9.82	11.17	8.39	8.69	7.68	7.93	2.50	1.97	3.64	none
.80	11.65	14.14	11.55	11.77	8.45	[illegible]	2.29	2.11	4.01	2.50
ne	none	none	4.23	none	none	none	0.74	none	2.68	none
01	none	4.91	7.33	7.10	6.66	7.16	1.23	1.36	3.11	2.71
85	none	9.08	9.85	10.22	7.22	7.49	1.68	1.96	3.70	3.03
.55	12.17	15.41	11.86	12.17	8.27	8.68	2.41	2.40	3.24	3.48
66	5.17	4.75	4.08	3.94	6.43	5.68	1.15	1.16	3.07	2.54
ne	8.10	none	7.07	none	8.22	none	1.48	none	4.21	none
.65	12.22	11.84	10.15	10.45	10.23	10.35	2.32	2.44	4.46	4.45
ne	12.85	none	10.05	none	9.27	none	2.09	none	5.03	none

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STRESSES AND D

	1		2		3		4
	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1
I. Test of McLean Cartridge Type Ejector (Test in Jig #2)							
1/3 Charge (0.081" Orifice)	none	none	none	none	none	none	none
2/3 Charge (0.081" Orifice)	none	none	none	none	none	none	none
Full Charge (0.081" Orifice)	none	none	none	none	none	none	none
Full Charge (0.062" Orifice)	none	none	none	none	none	none	none
Full Charge (No Orifice)	none	none	none	none	none	none	none
II. Test of Douglas Cartridge Type Ejector							
1/3 Charge (Jig #1)	9100	6400	10,700	7300	none	none	[illegible]
2/3 Charge (Jig #1)	12,650	10,900	15,250	12,750	none	none	none
Full Charge (Jig #1)	19,350	19,500	21,500	23,550	2010	1505	9250
Full Charge (Jig #2)	none	none	none	none	none	none	none
III. Test of McLean Air Piston Type Ejector, Condition II							
1000 PSI Pressure	9100	8050	10,850	10,240	2025	1876	5600
1500 PSI Pressure	10,180	11,180	12,750	14,130	2360	2370	6500
2000 PSI Pressure	11,800	12,200	14,720	16,620	2550	2665	7000
2400 PSI Pressure	15,380	14,820	19,550	17,700	3030	2800	6420
IV. Test of McLean Air Piston Type Ejector, Condition V							
500 PSI Pressure	none	none	none	none	none	none	none
1000 PSI Pressure	7450	6960	8860	8750	992	1770	5910
1500 PSI Pressure	none	none	none	none	1950	1257	7400
2000 PSI Pressure	none	none	none	none	2230	2300	6980
V. Test of Republic Air Piston Type Ejector							
1000 PSI Pressure	16,450	14,000	16,700	14,800	1668	1452	5[illegible]
1500 PSI Pressure	18,300	none	18,650	none	1946	none	7[illegible]
2000 PSI Pressure	24,500	24,240	24,600	23,550	3200	3100	1[illegible]
2500 PSI Pressure	24,560	none	24,640	none	2990	none	10,1[illegible]

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	*8		*9		*10		F3		**Displacement (In)	
un 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
one	none	none	528	none	649	none	none	none	none	none
one	none	none	995	1395	764	1575	none	none	0.005	0.005
one	none	none	1150	1219	1116	1445	none	none	0.011	0.011
one	none	none	1660	1520	1614	1615	none	none	0.060	none
one	none	none	1894	1858	2000	2000	none	none	none	none
565	1518	820	7170	6970	6910	6850	1793	1508	0.025	0.018
925	850	490	13,370	11,800	9600	11,250	3355	2050	0.026	0.019
250	8650	9750	15,350	14,960	9530	13,550	4570	5170	0.047	0.037
one	none	none	13,130	13,300	none	none	none	none	0.040	0.035
.515	1308	1090	9400	9530	11,370	11,600	1900	1762	0.032	0.032
.860	1225	1205	11,530	11,670	none	14,500	2625	2862	0.037	0.036
.127	1075	1150	13,020	12,870	none	14,850	3245	3275	0.041	0.044
.895	1665	1820	18,120	18,400	18,070	18,050	3215	4680	0.053	0.045
none	none	none	3250	none	3490	none	none	none	0.031	none
none	none	none	4875	4750	5340	5420	2010	1905	none	0.036
none	none	730	6030	5900	6250	6780	2325	1978	0.029	0.049
none	830	856	6500	6500	9900	none	2800	2690	0.031	0.032
1142	1697	1000	10,670	10,070	11,180	10,150	2050	2010	0.025	0.026
none	1455	none	15,600	none	15,600	none	1423	none	0.028	none
2730	2340	2370	20,600	20,300	20,050	19,950	1504	1630	0.037	0.031
none	2325	none	21,300	none	20,500	none	1525	none	0.035	none

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TABLE IV

STRESSES AND DEFLECTIONS PRODUCED - DYNAMIC EJECTOR PERFORMANCE TESTS OF THE TX-7

(Stress - psi)

Strain Gage Numbers

3	4		5		6		* 7		* 8	
Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2	Run 1	Run 2
none	none	none	none	none	none	none	none	none	none	none
none	none	none	none	none	none	none	none	none	none	none
none	none	none	none	none	none	none	none	none	none	none
none	none	none	none	none	none	none	none	none	none	none
none	none	none	none	none	none	none	none	none	none	none
none	2080	2750	5070	4300	none	none	1463	1565	1518	820
none	none	none	none	none	none	none	2170	1925	850	490
1505	9250	9500	14,800	15,600	none	none	7260	9250	8650	9750
none	none	none	none	none	none	none	none	none	none	none
1376	5600	5100	5250	5000	none	none	1565	1515	1308	1090
2370	6500	6300	7700	7840	none	none	1565	1860	1225	1205
2665	7200	6400	9520	9600	none	none	1053	1127	1075	1150
2800	6400	9120	9940	10,980	1077	none	1443	1895	1665	1820
none	none	none	none	none	none	none	none	none	none	none
1770	5910	5550	4790	4550	none	none	none	none	none	none
1257	7400	6200	6150	5780	none	none	none	none	none	730
2300	6980	6850	7560	7620	none	none	none	none	830	856
1452	5120	3620	6150	416	none	none	1100	1122	1097	1000
none	7100	none	7900	none	none	none	1595	none	1455	none
3100	11,350	10,060	10,300	10,[illegible]	none	none	2245	2790	2340	2370
none	10,100	none	10,830	none	none	none	2490	none	2325	none

* - Stress due to bending

** - Displacement of center of carrying beam relative to sphere case

UNCLASSIFIED

[redacted]