REPORT NUMBER 155

MARCH 1965

NOSE LANDING GEAR DROP TEST REPORT

XV-5A

LIFT FAN FLIGHT RESEARCH AIRCRAFT PROGRAM

CONTRACT NUMBER DA44-177-TC-715

GENERAL ELECTRIC

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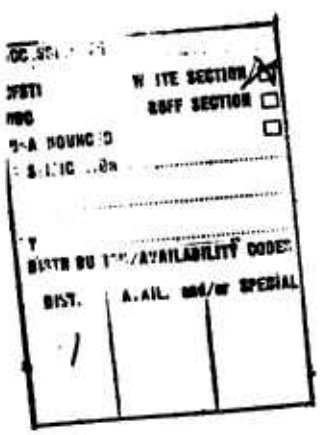
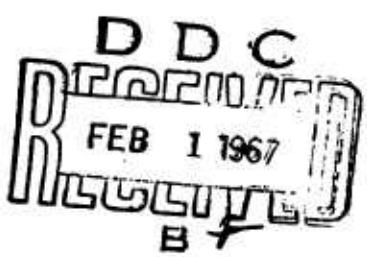
REPORT NUMBER 155

NOSE LANDING GEAR DROP TEST REPORT

XV-5A Lift Fan
Flight Research Aircraft Program





March 1965

ADVANCED ENGINE AND TECHNOLOGY DEPARTMENT
GENERAL ELECTRIC COMPANY
CINCINNATI, OHIO 45215

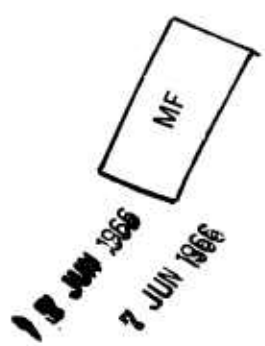


TABLE OF CONTENTS

1.0 GENERAL:

The 1511L100 Nose Landing Gear Shock Strut was tested on 26 July 1963, in accordance to the H. W. Loud Test Procedure 1511LTP-4, Revision "A". This report presents the successful completion of the established test requirements.

The tests were witnessed by Ryan and H. W. Loud Quality Control and Mr. Fred Doring, F. A. A. Western Regional Headquarters.

2.0 APPLICABLE DOCUMENTS:

2.1 1511LTP-4, Revision "A", H. W. Loud Drop Test Procedure

2.2 SCDL0002, Ryan Nose Gear Specification

2.3 Wire dated July 25, 1963 confirming test requirement deviation.

3.0 SUMMARY:

The results of the tests demonstrate satisfactory energy absorbtion characteristics of the shock absorber.

The first test condition results meets the requirements of the deviation allowance.(see Appendix B). The vertical reaction exceeds the original requirements for approximately .05 seconds at a strut stroke of 4.15 inches with a maximum of 6600 pounds.

3.0 SUMMARY: (con't)

The second condition results meets the test requirements.

The official test for condition three was run with an additional 200 pounds on the jig that was anticipated to correct for friction in the drop tower. The results indicate, however, excessive energy input. A prior run is also included with the correct jig weight and with insufficient energy input to show the effect of the weight change. Both runs are well within the maximum allowable vertical reaction.

4.0 DISCUSSION:

The shock strut was mounted in the drop tower (See Figure I). The ground reactions were measured with a reaction platform (See Figure II). The strut was serviced with hydraulic fluid and extended with 154 psig air pressure. The tire was inflated to 155 psig.

The tests were performed in accordance with the 1511LTP-4 Test Procedure. See Appendix A for a copy of the test requirements taken from the procedure.

4.0 DISCUSSION: (con't)

A deviation was granted by Ryan (See Appendix B) on condition number one allowing for an increase in vertical reaction to 7000 pounds after the first four inches of strut stroke.

Figure III shows the configuration of the metering pin and orifice.

5.0 RESULTS:

The test results are given in Table I. The curves of vertical load vs stroke are given in Figures IV, V, VI, and VII. The actual test records are fold out pages

TABLE I

Record No.	9691	9687	9685	9680	
Results *	Cond. 1	Cond. 2	Cond. 3	Cond. 3 **	Units
Wheel Speed	2200	-	2570	2550	rpm
Max. Vertical Reaction	6600	8270	4070	3800	pounds
Max. Drag Reaction	2060	-	1760	1360	pounds
Jig Contact Velocity	10.02	10.0	6.1	6.1	feet/second
Total Strut Stroke	6.44	7.42	5.84	5.86	inches
Total Mass Travel	8.07	9.92	7.35	6.37	inches
Strut Efficiency	83.6	75.5	-	-	percent
Energy Absorbed	3670	5004	2190	1440	foot-pounds
Max. Vertical*** Reaction 0-4" Strut Stroke	6140	-	-	-	pounds

* See Appendix A for drop test requirements.

** Drop made prior to official tests not witnessed by required agencies.

*** See Appendix B.

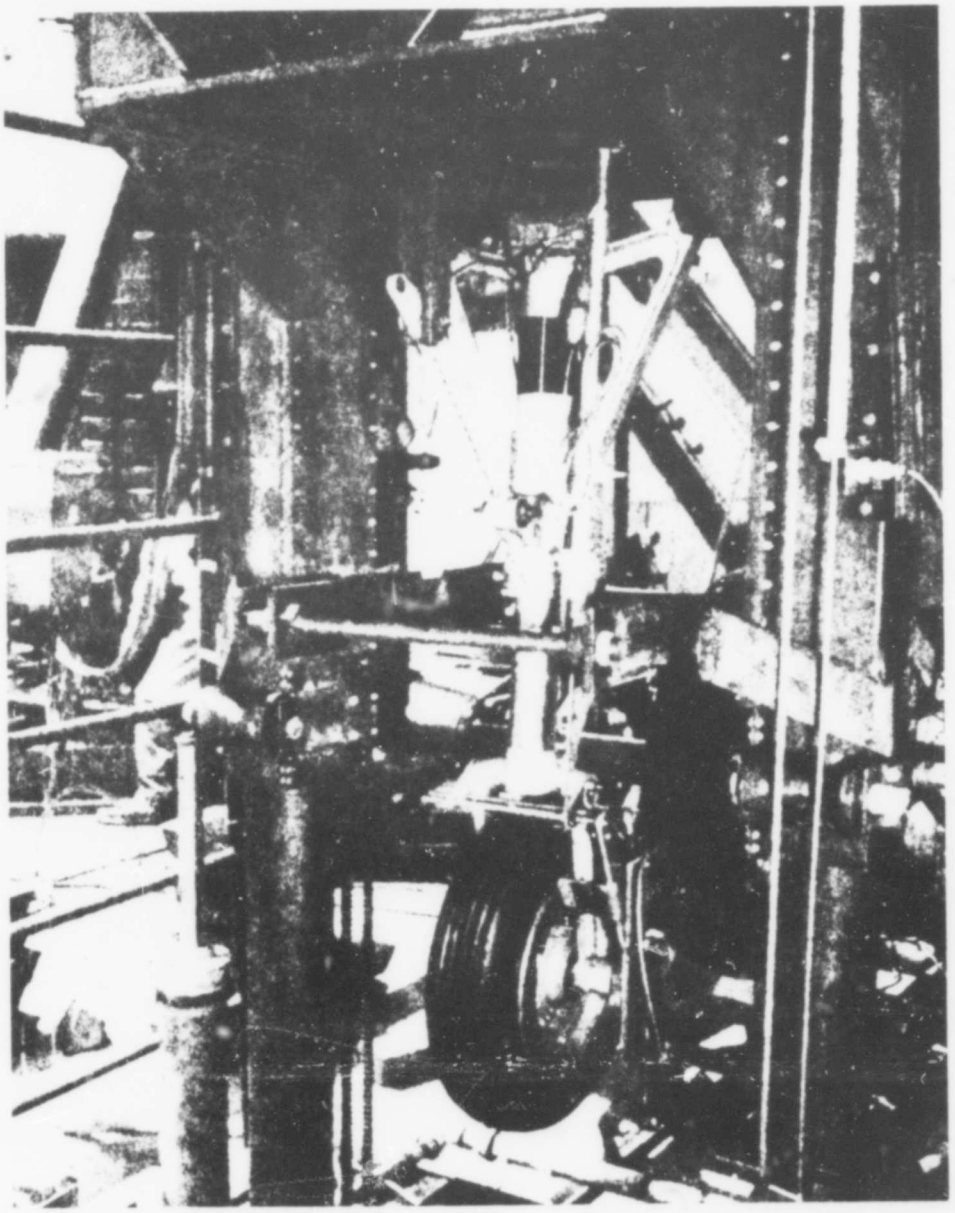


FIGURE I
DROP TEST TOWER
XV5A NOSE LANDING GEAR

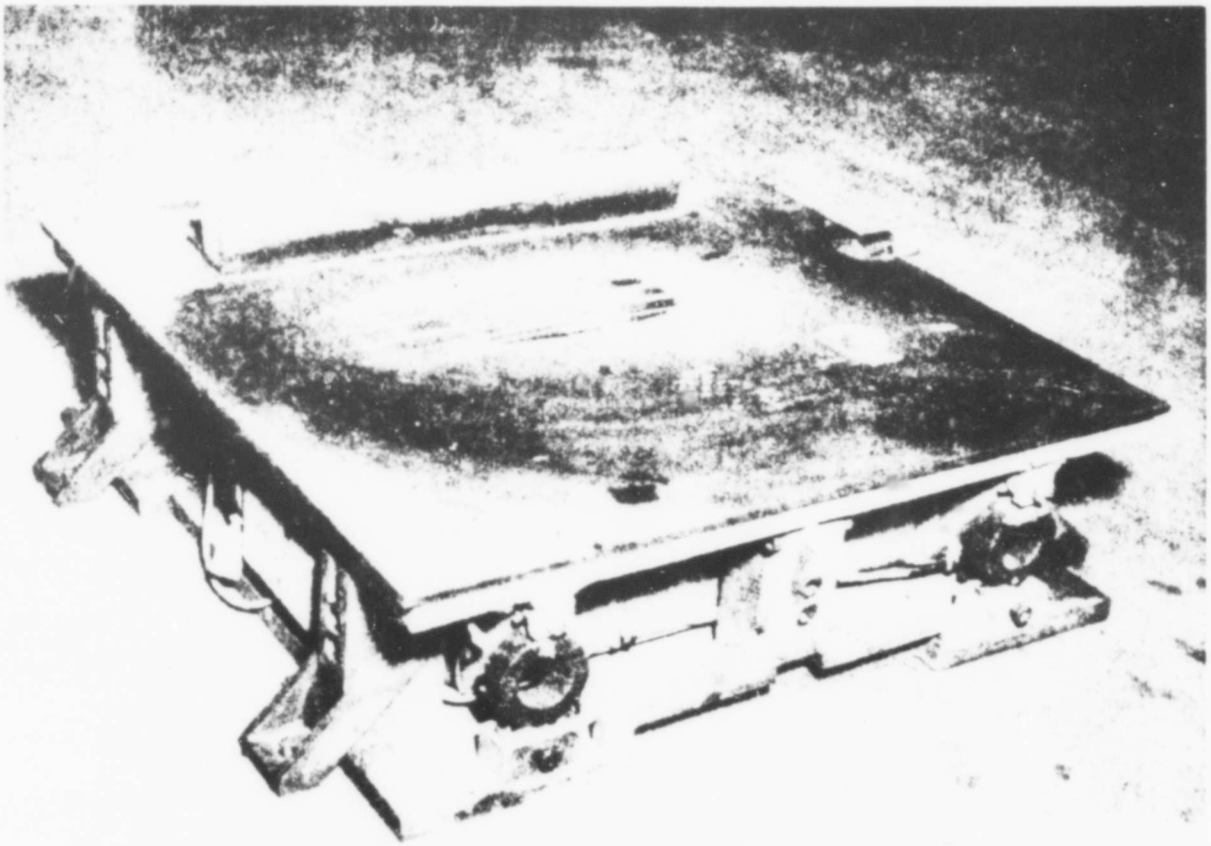
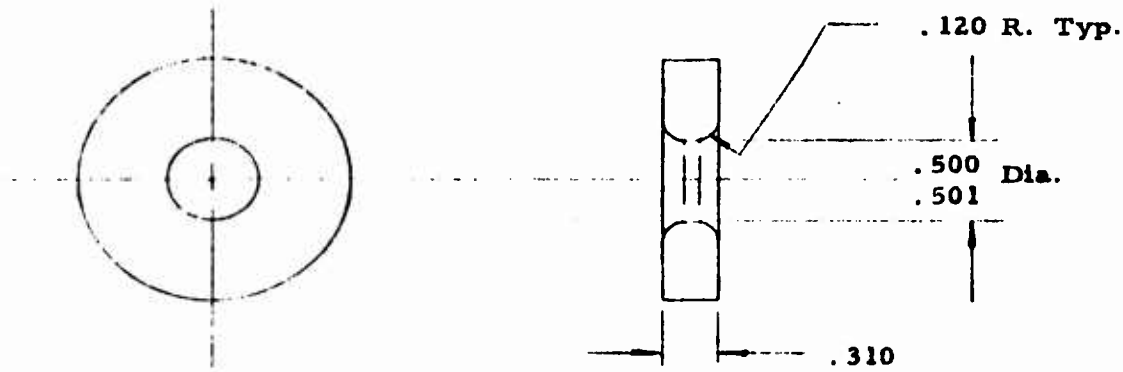


FIGURE II

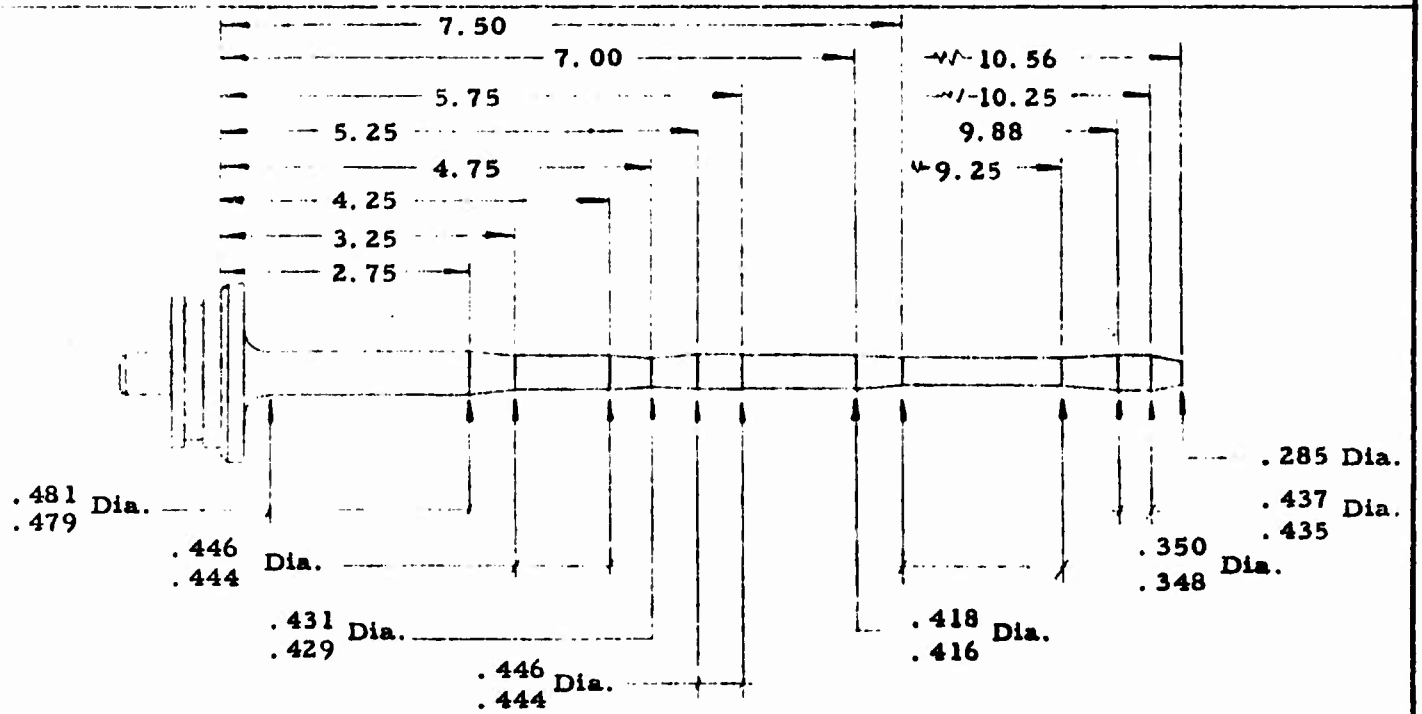
REACTION PLATFORM
10,000 # VERTICAL REACTION
5,000 # HORIZONTAL REACTION

H. W. LOUD MACHINE WORKS, Inc.
POMONA, CALIFORNIA

FIGURE III



1511L116 ORIFICE CONFIGURATION (FULL SIZE)



1511L125 METERING PIN CONFIGURATION (HALF SIZE)

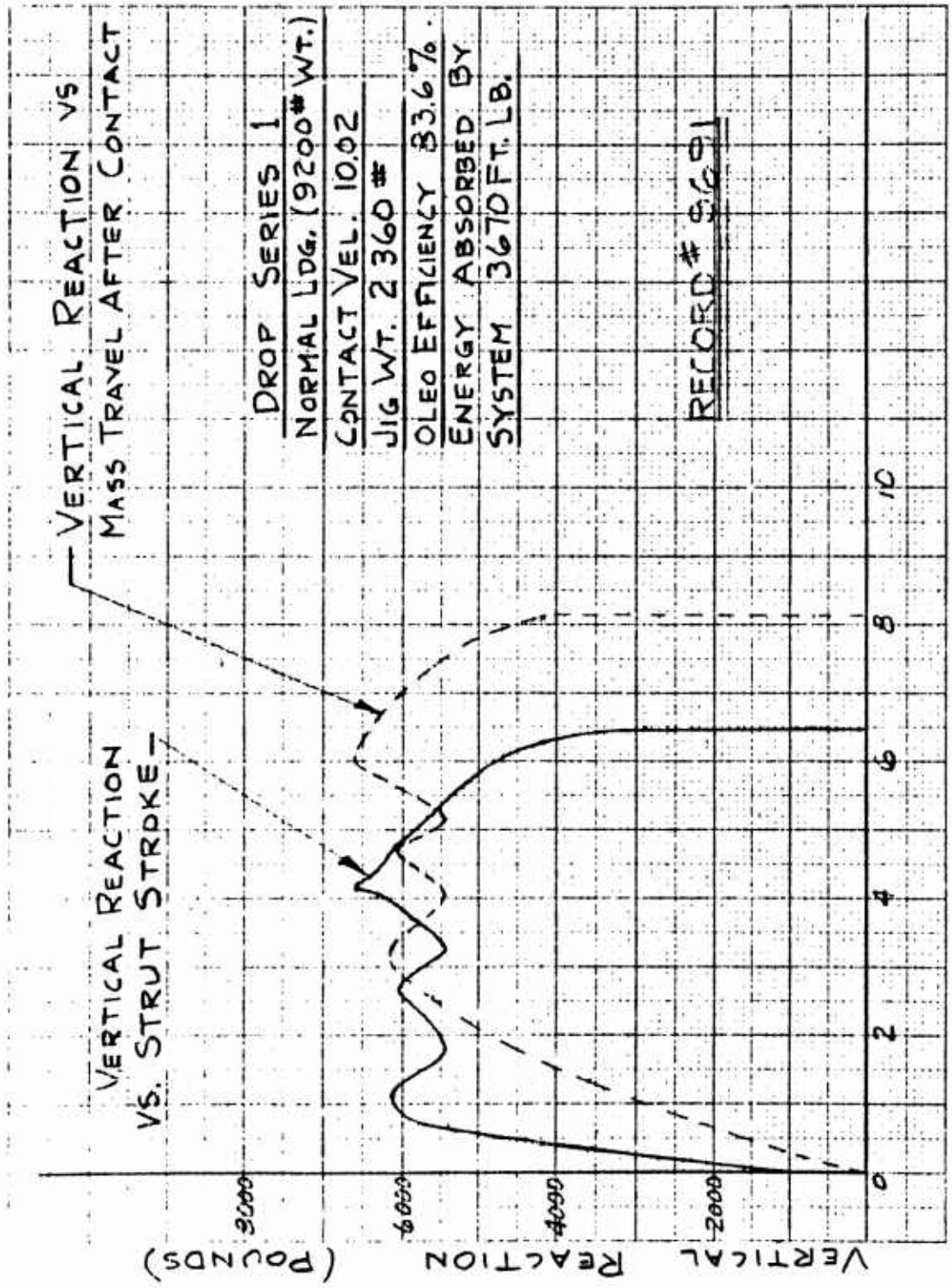

VERTICAL REACTION VS
MASS TRAVEL AFTER CONTACT
VERTICAL REACTION
VS. STRUT STROKE-
DROP SERIES 1
NORMAL LDG. (9200# WT.)
CONTACT VEL. 10.02
JIG WT. 2360 #
OLEO EFFICIENCY 83.6%.
ENERGY ABSORBED BY
SYSTEM 367 FT. LB.
RECORD # 5691
VERTICAL REACTION (POUNDS)
2000
4000
6000
0
2
4
6
8
10
STRUT STROKE OR MASS TRAVEL ~ INCHES

FIGURE IV

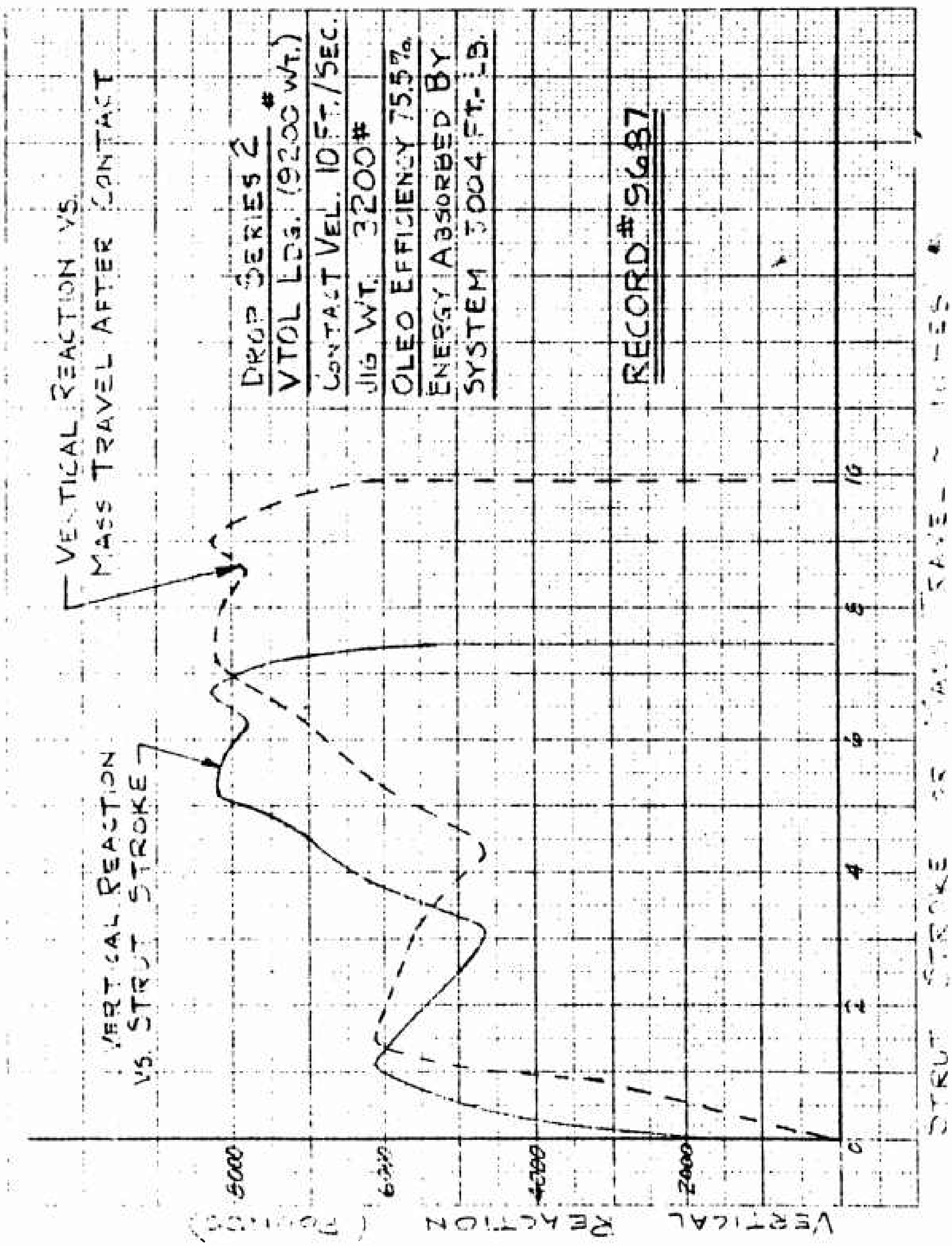

VERTICAL REACTION VS. MASS TRAVEL AFTER CONTACT
VERTICAL REACTION VS. STRUT STROKE
DROP SERIES 2 #
VTOL LDG. (9200 WT.)
CONTACT VEL. 10 FT./SEC.
JIG WT. 3200#
OLEO EFFICIENCY 75.5%
ENERGY ABSORBED BY SYSTEM 3004 FT.-LB.
RECORD #9687
8000
6000
4000
2000
0
2
4
6
8
10
VERTICAL REACTION (POUNDS)

FIGURE V

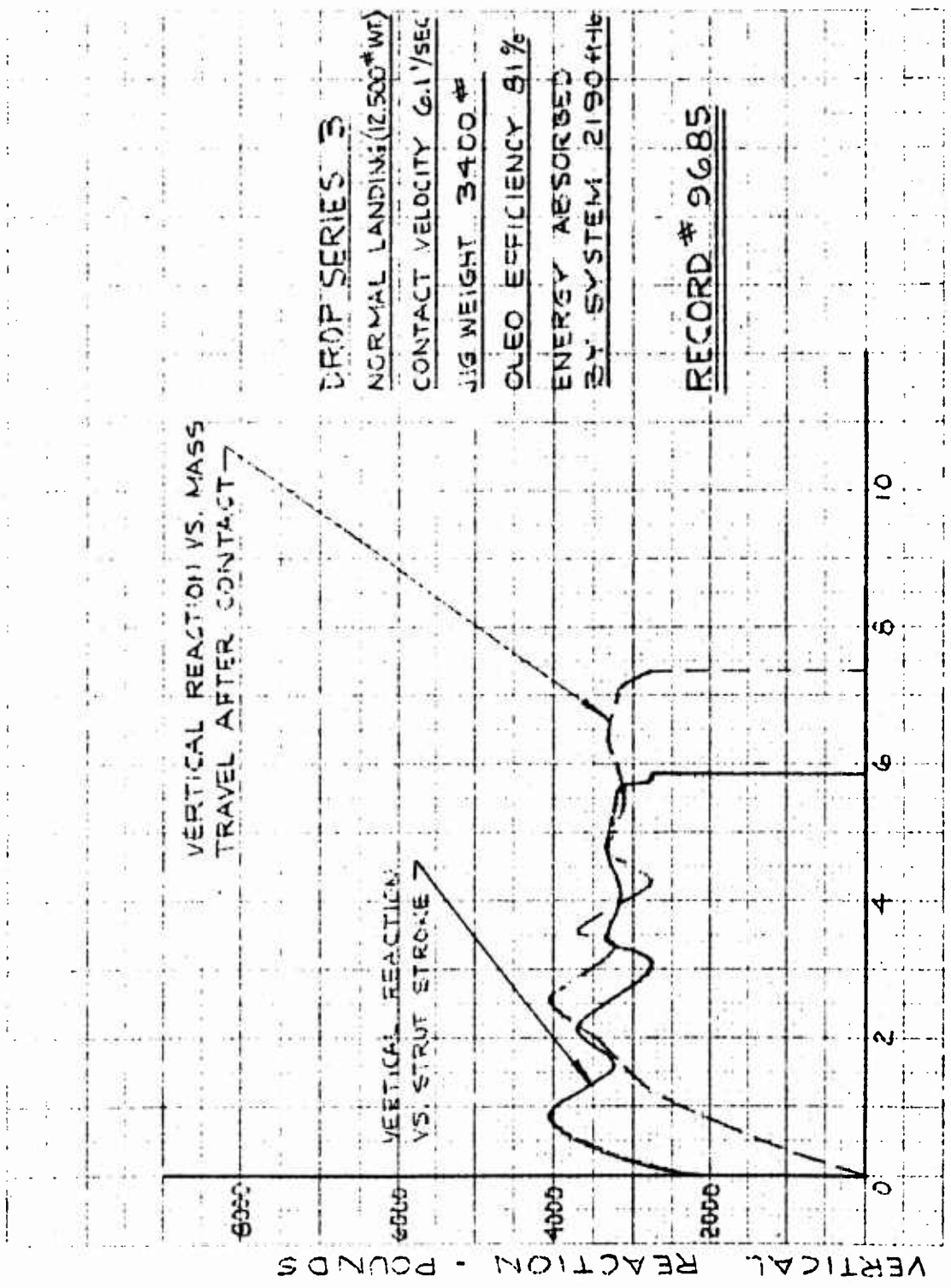

VERTICAL REACTION - POUNDS
STRUT STROKE OR MASS TRAVEL - INCHES
VERTICAL REACTION VS. STRUT STROKE
VERTICAL REACTION VS. MASS TRAVEL AFTER CONTACT
DROP SERIES B
NORMAL LANDING (12,500# WT)
CONTACT VELOCITY 6.1'/SEC
JIG WEIGHT 3400#
OLEO EFFICIENCY 81%
ENERGY ABSORBED BY SYSTEM 21904 ft-lb
RECORD # 9685
6000
4000
2000
0
2
4
6
8
10

FIGURE VI

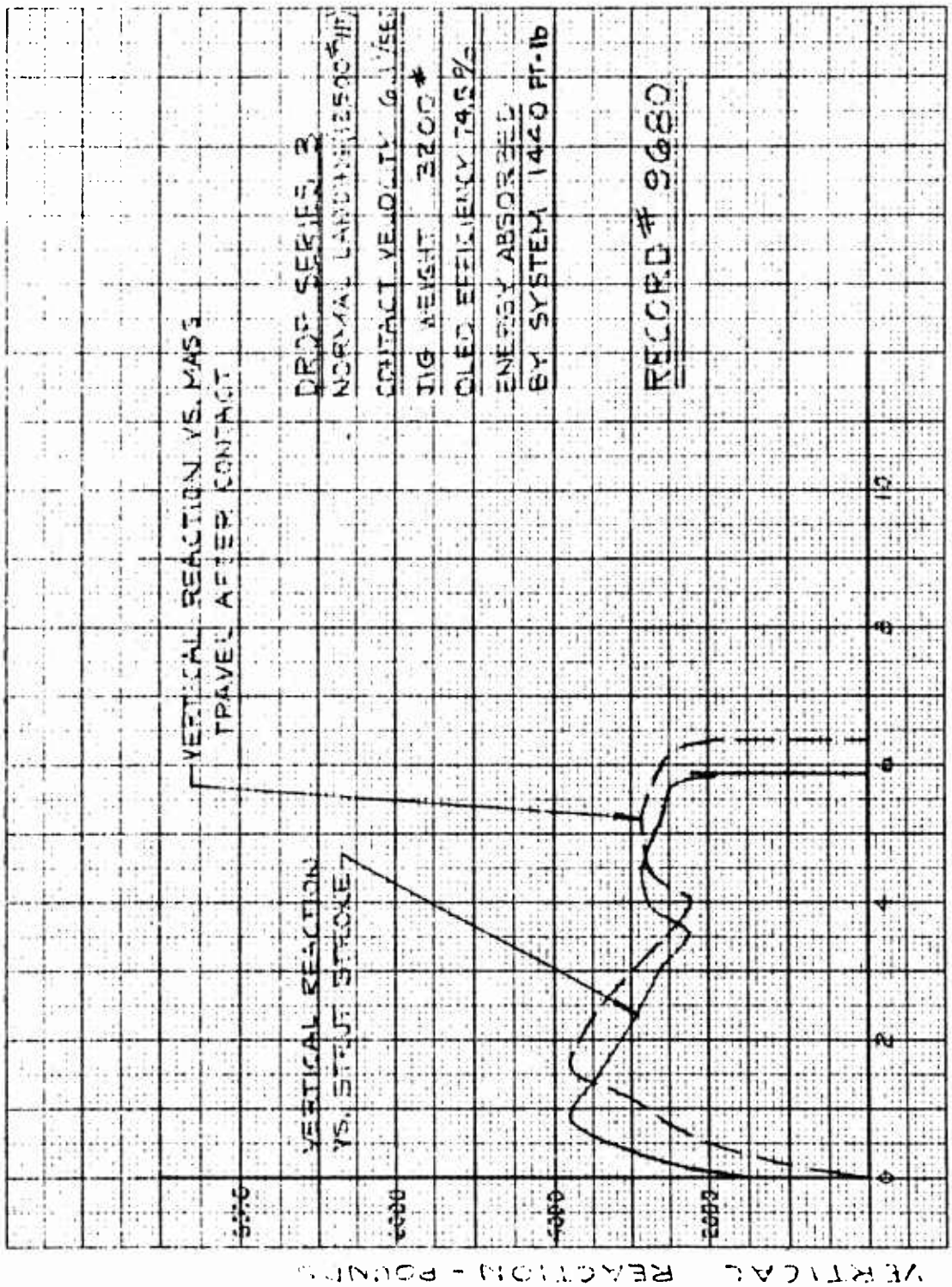
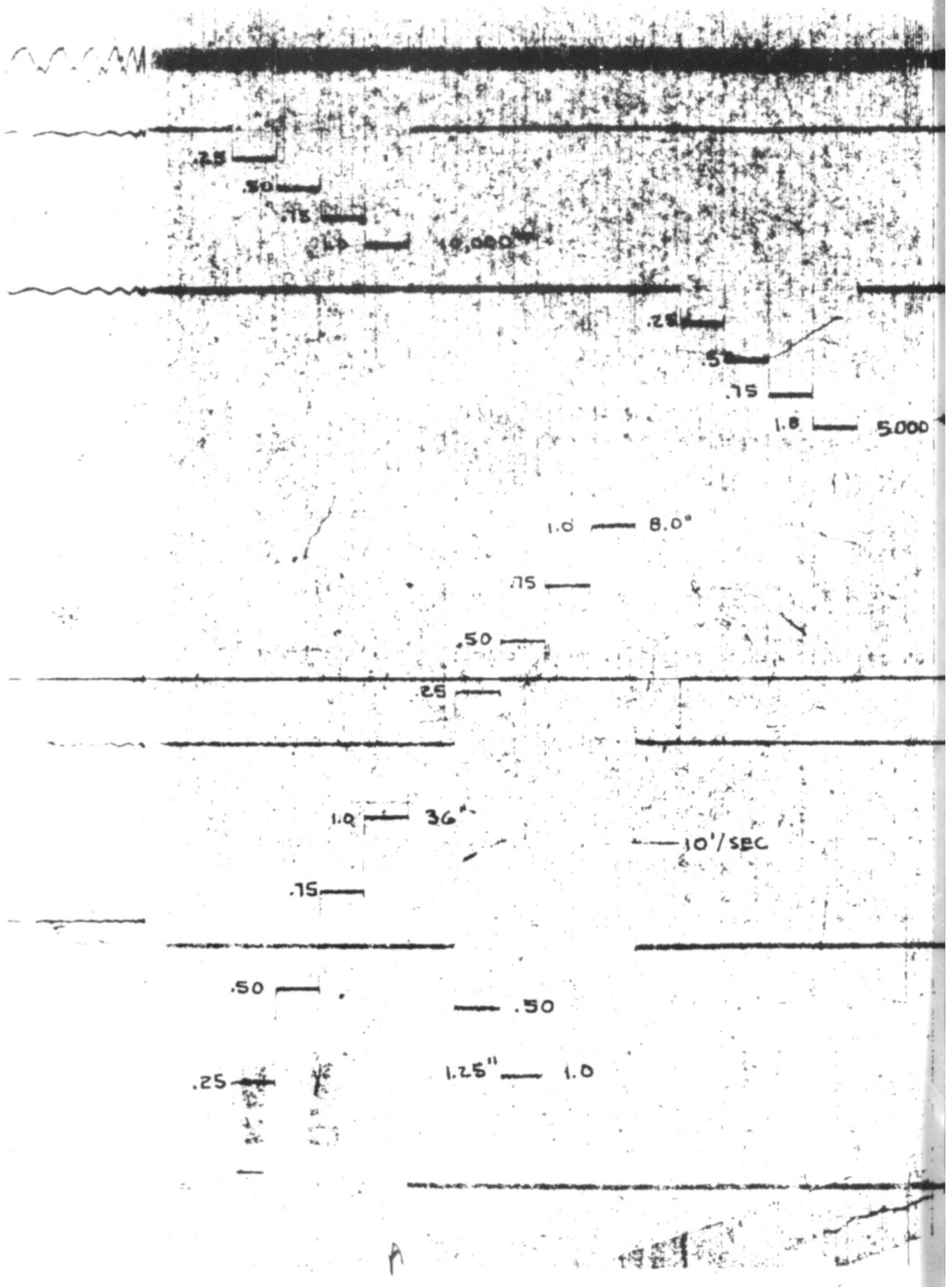

VERTICAL REACTION VS. MASS TRAVEL AFTER CONTACT
DROP SERIES 2
NORMAL LANDING
CONTACT VELOCITY
JIG WEIGHT 3200#
OLEO EFFICIENCY 74.5%
ENERGY ABSORBED BY SYSTEM 1440 FT-lb
RECORD # 9680
VERTICAL REACTION VS. STRUT STROKE
VERTICAL REACTION - POUNDS
STRUT STROKE OR MASS TRAVEL - INCHES

FIGURE VII


.25
.50
.75
1.0
10,000
.25
.5
.75
1.0
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1.0
8.0"
.75
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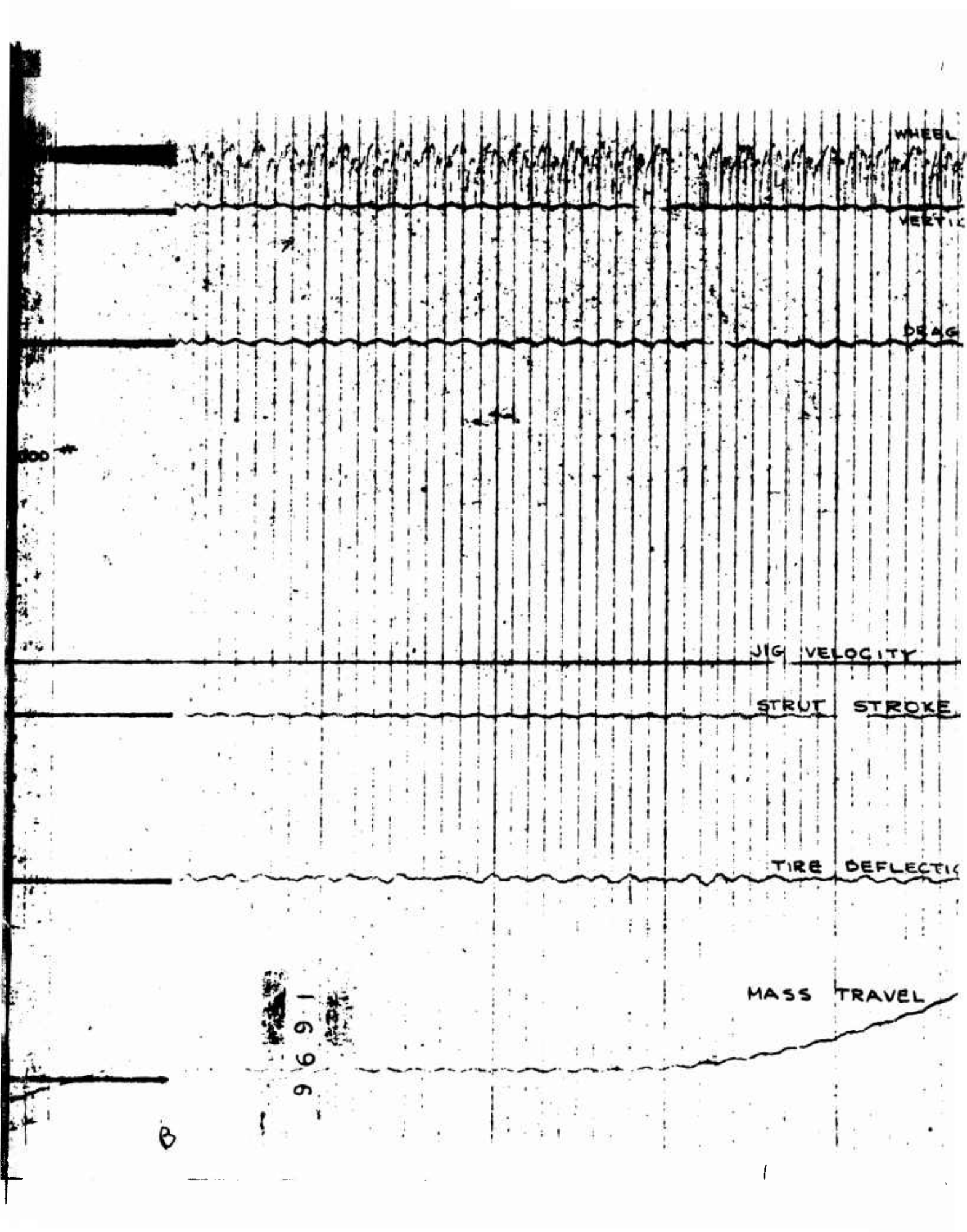
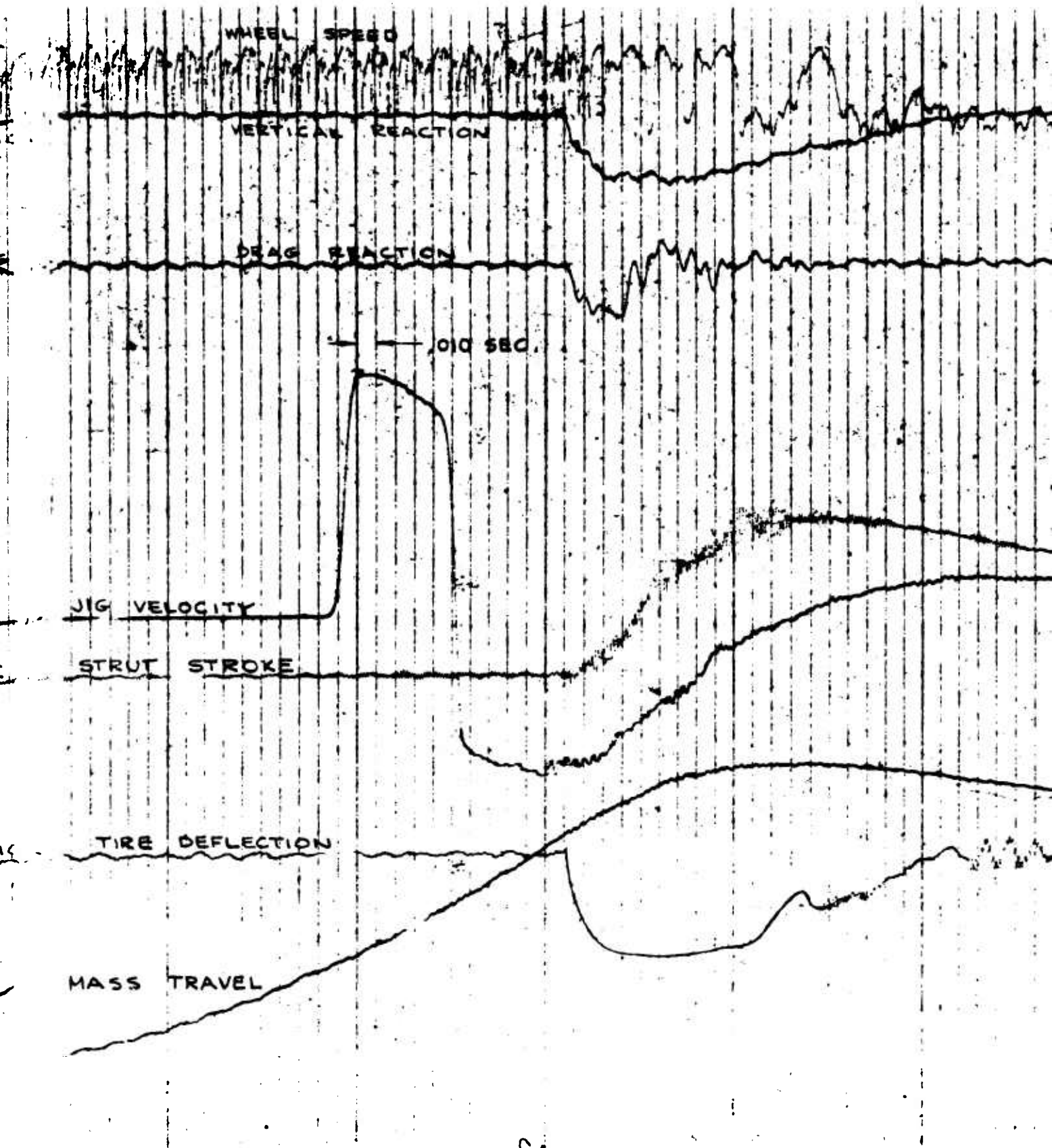
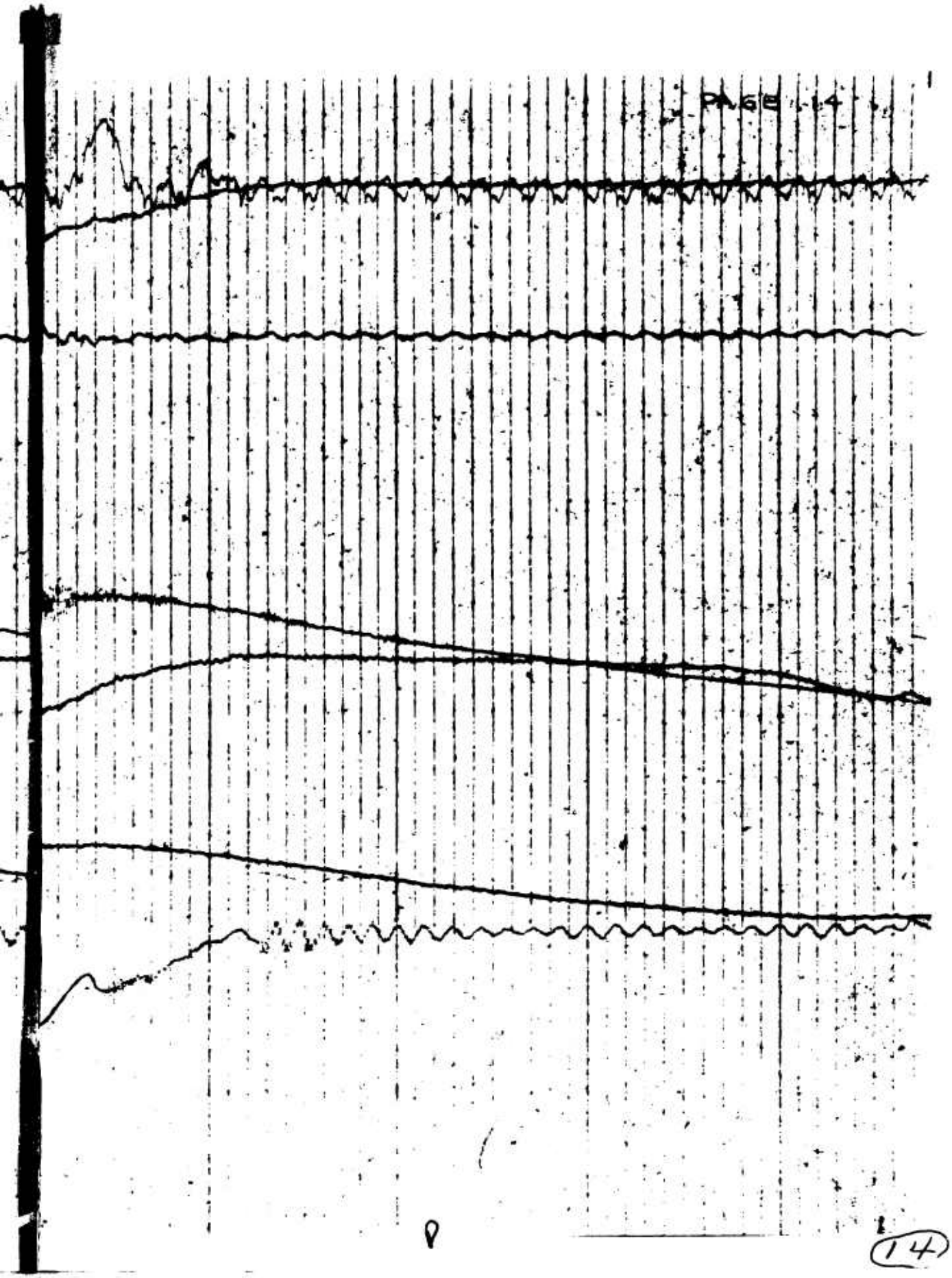
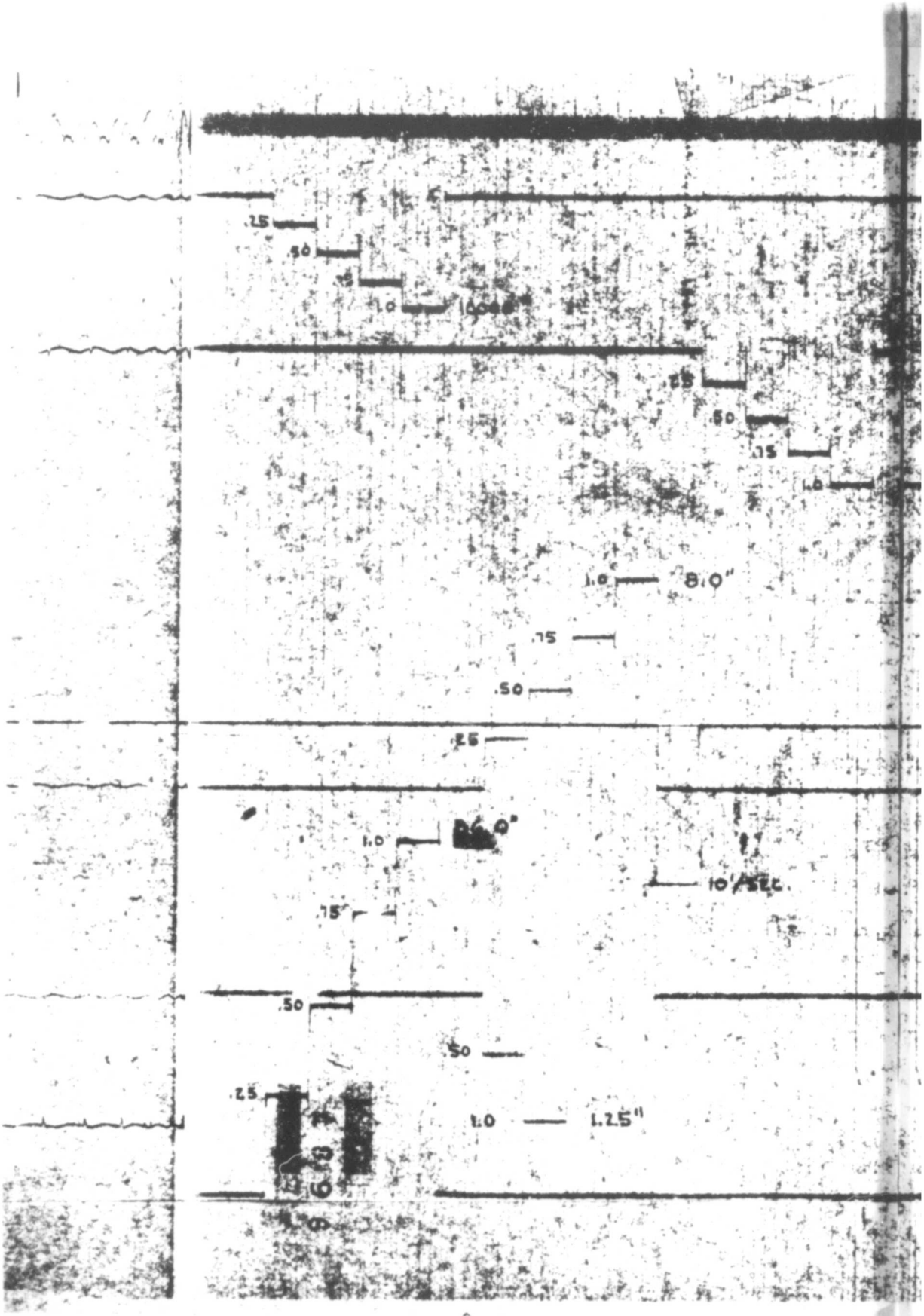
1.0
36"
10'/SEC
.75
.50
.50
.25
1.25"
1.0


WHEEL
VERTIC
DRAG
JIG VELOCITY
STRUT STROKE
TIRE DEFLECTIO
MASS TRAVEL
B


WHEEL SPEED
VERTICAL REACTION
DRAG REACTION
.010 SEC.
JIG VELOCITY
STRUT STROKE
TIRE DEFLECTION
MASS TRAVEL





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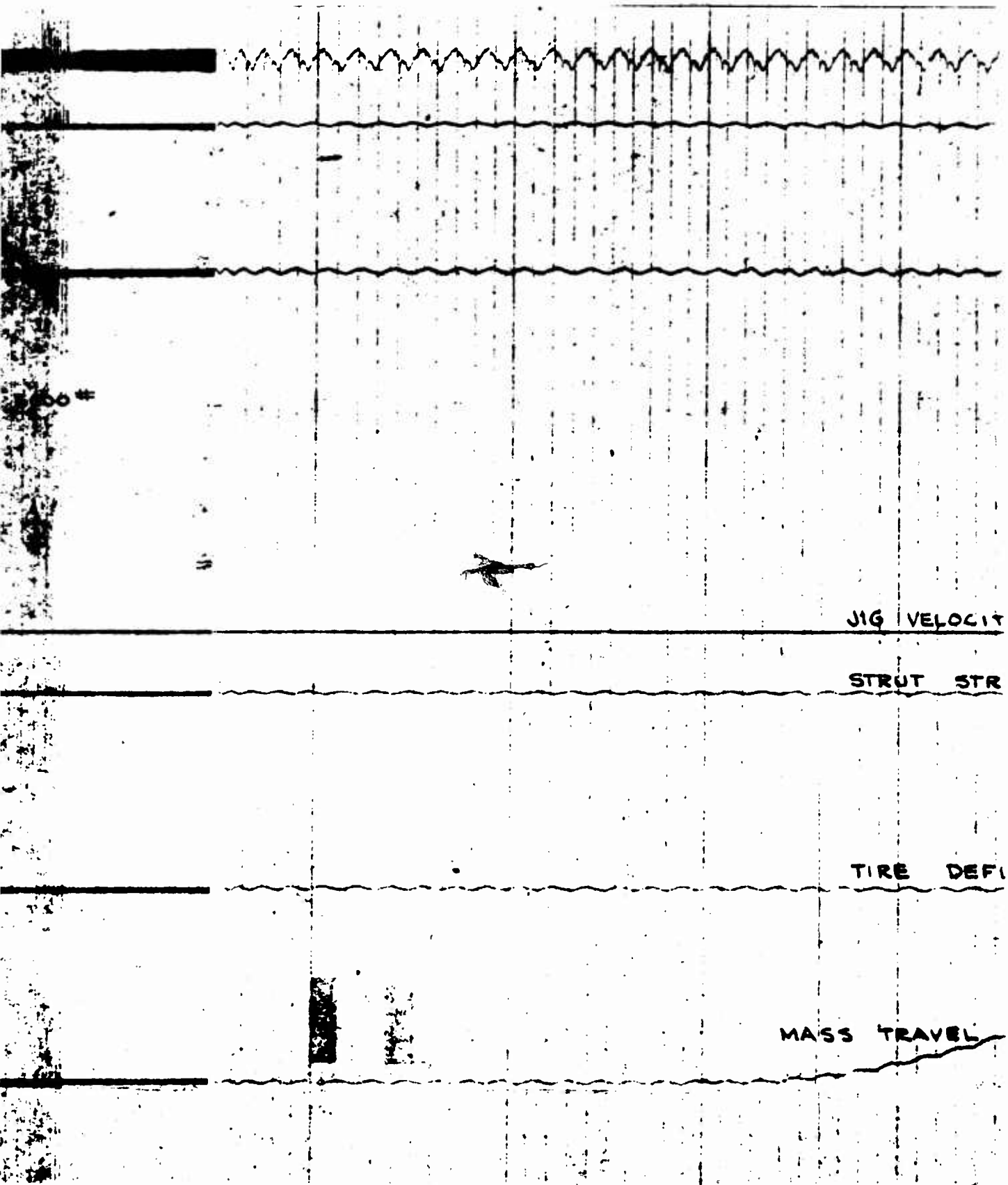

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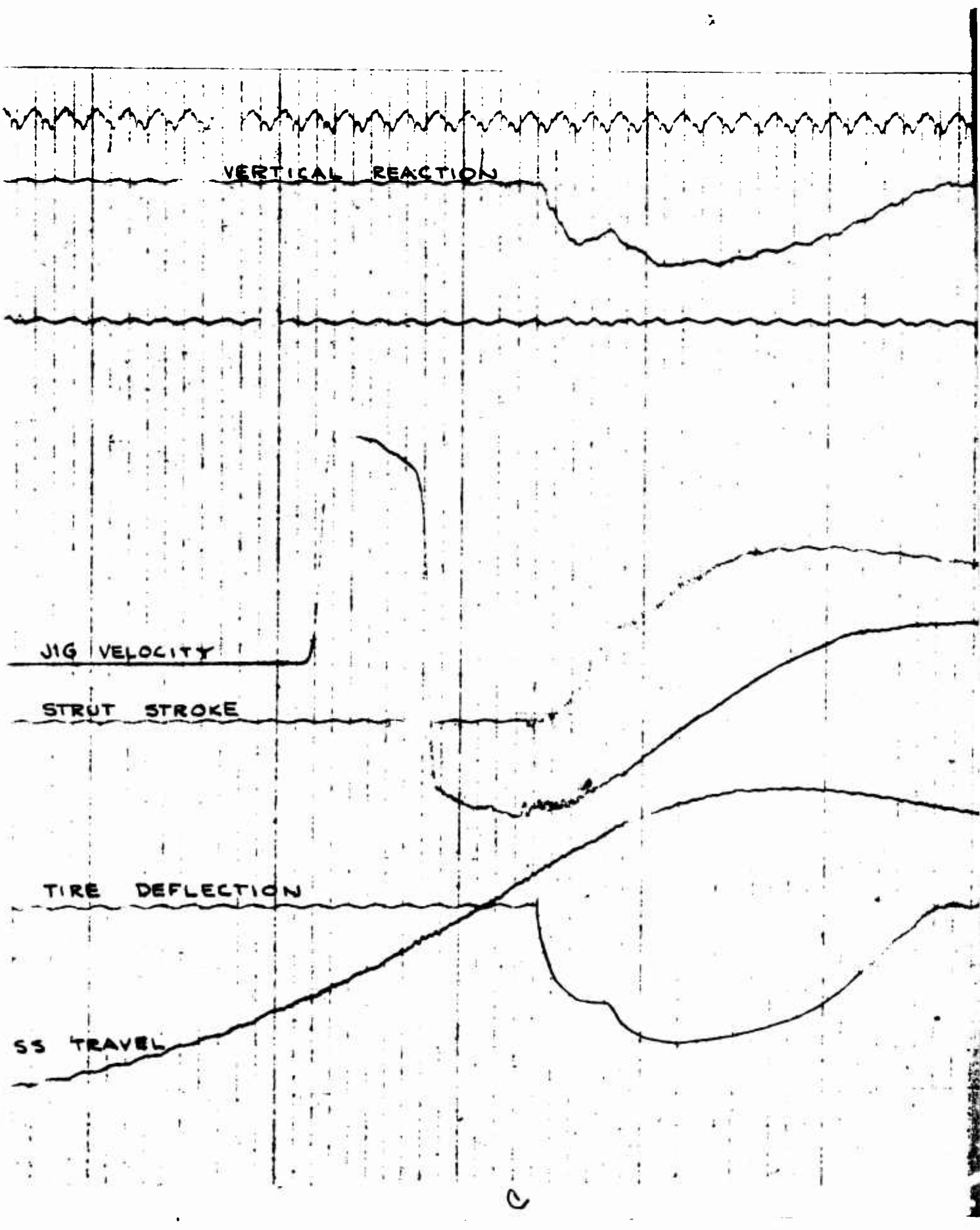
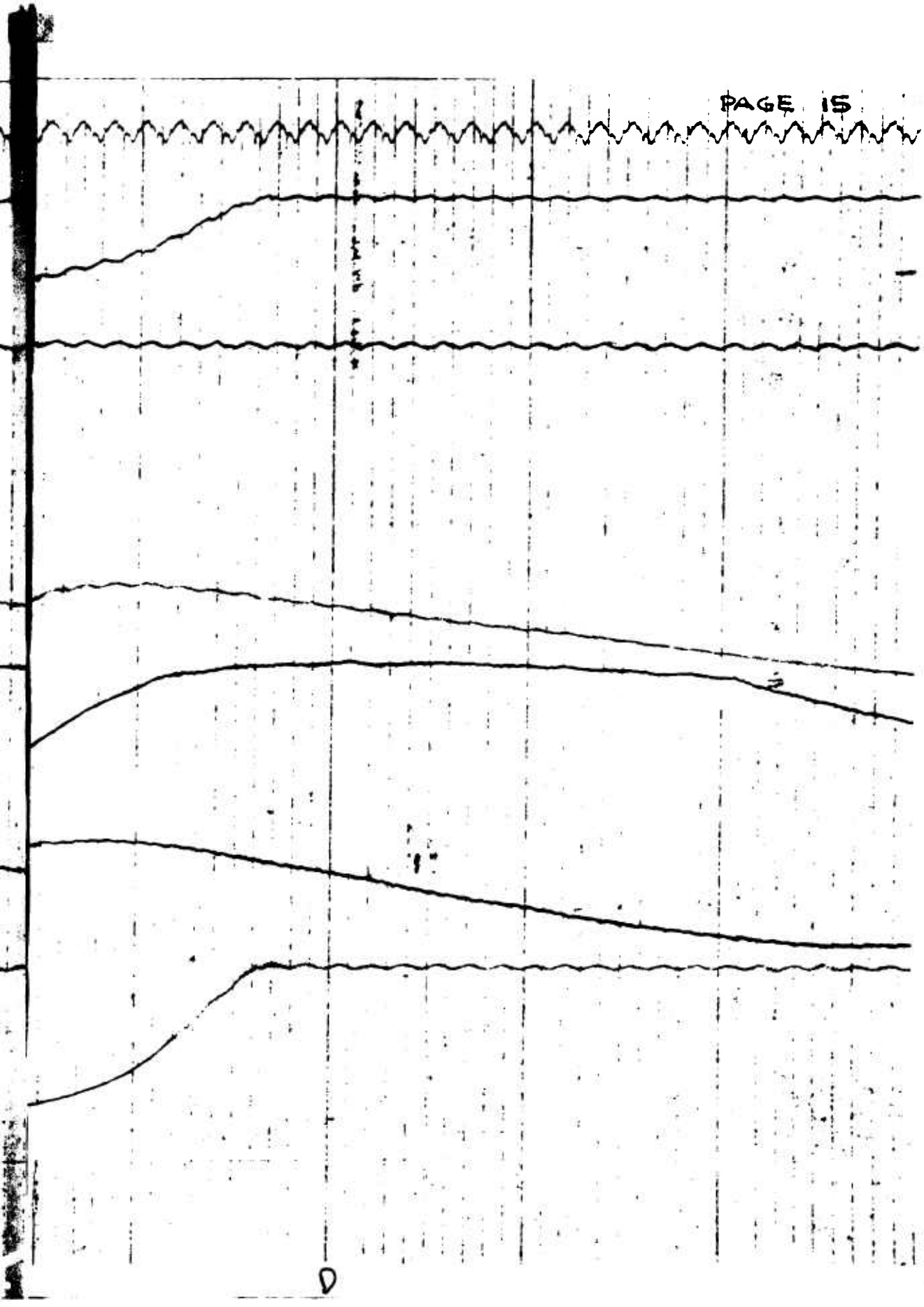

VERTICAL REACTION
JIG VELOCITY
STRUT STROKE
TIRE DEFLECTION
SS TRAVEL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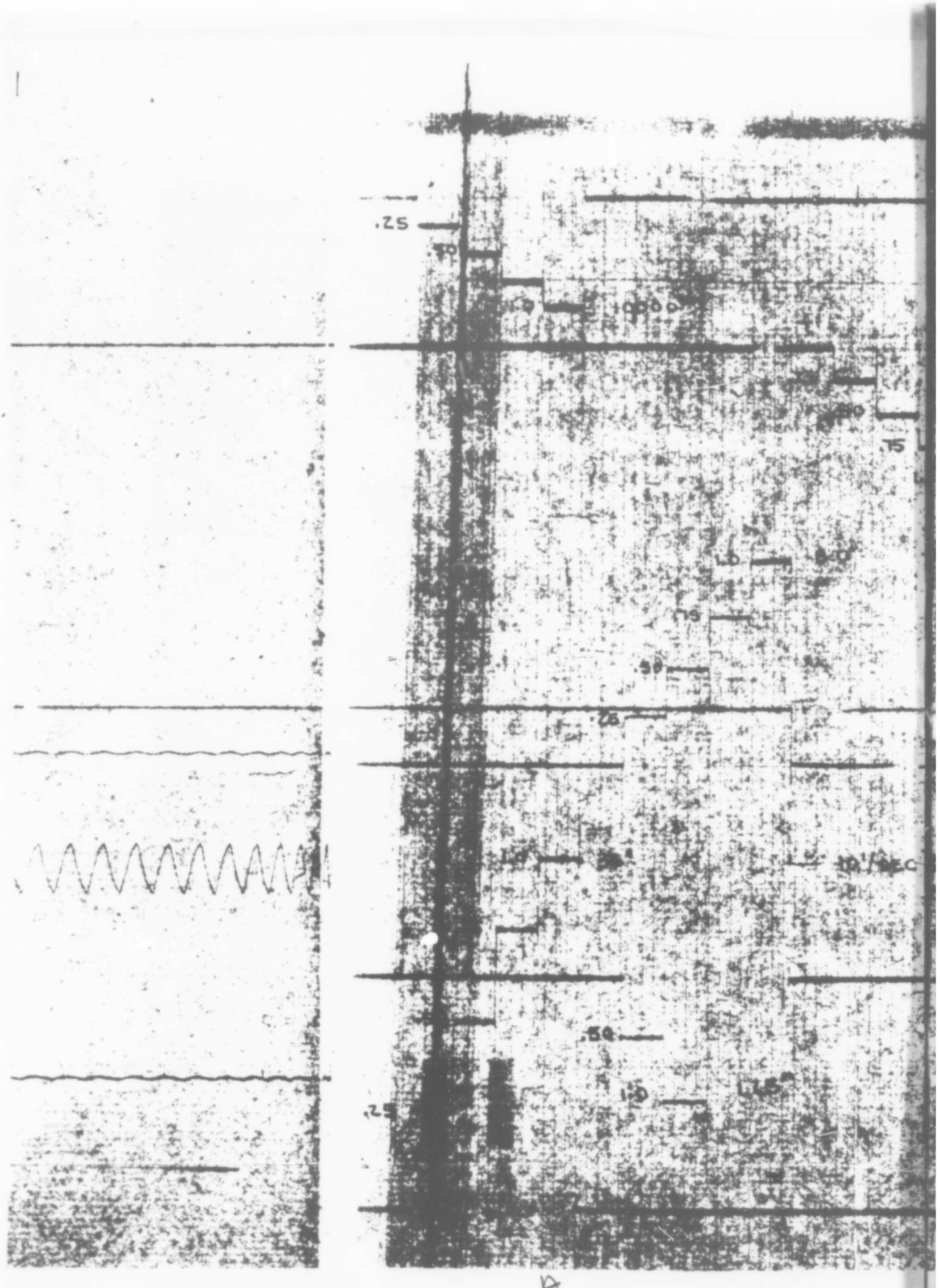

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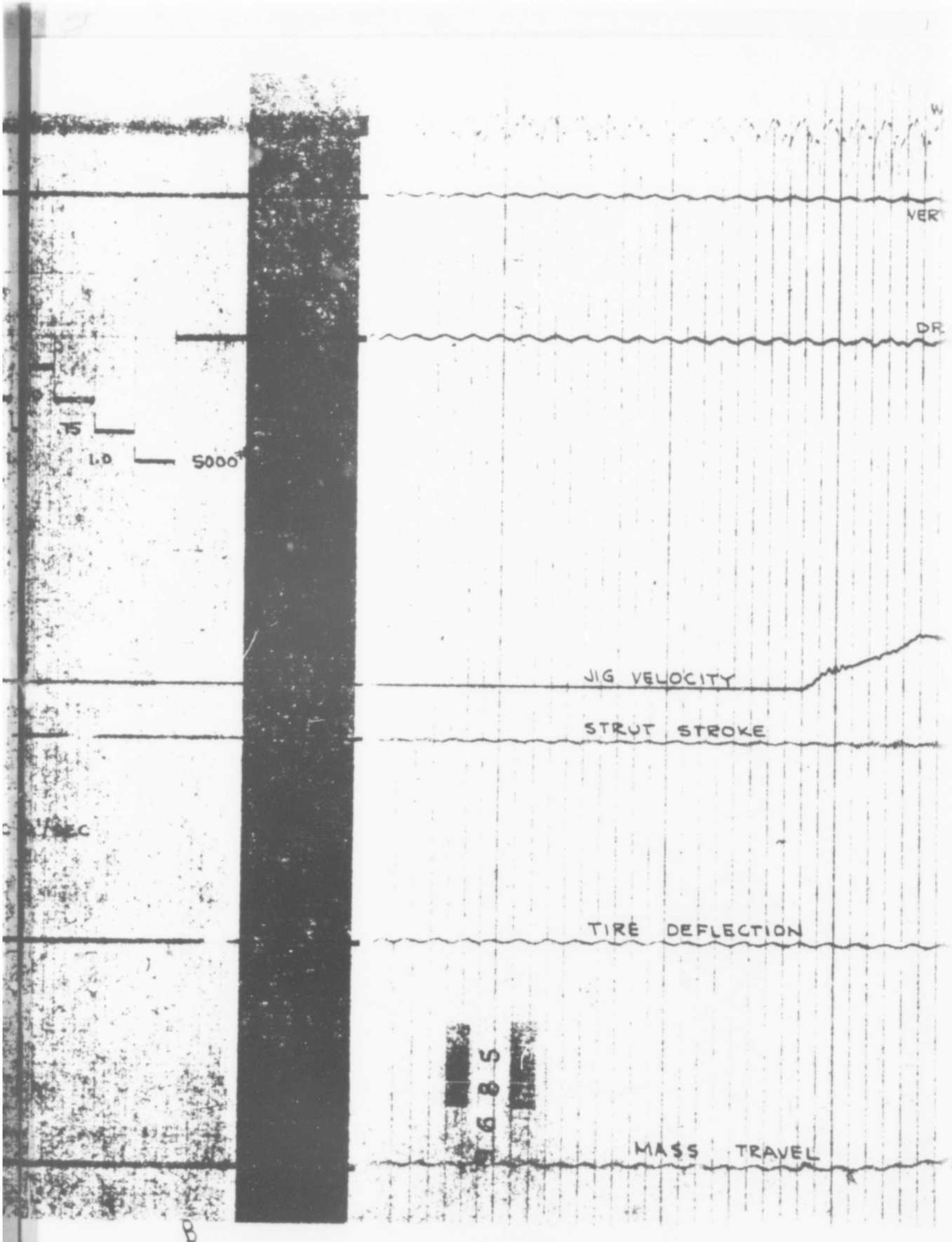
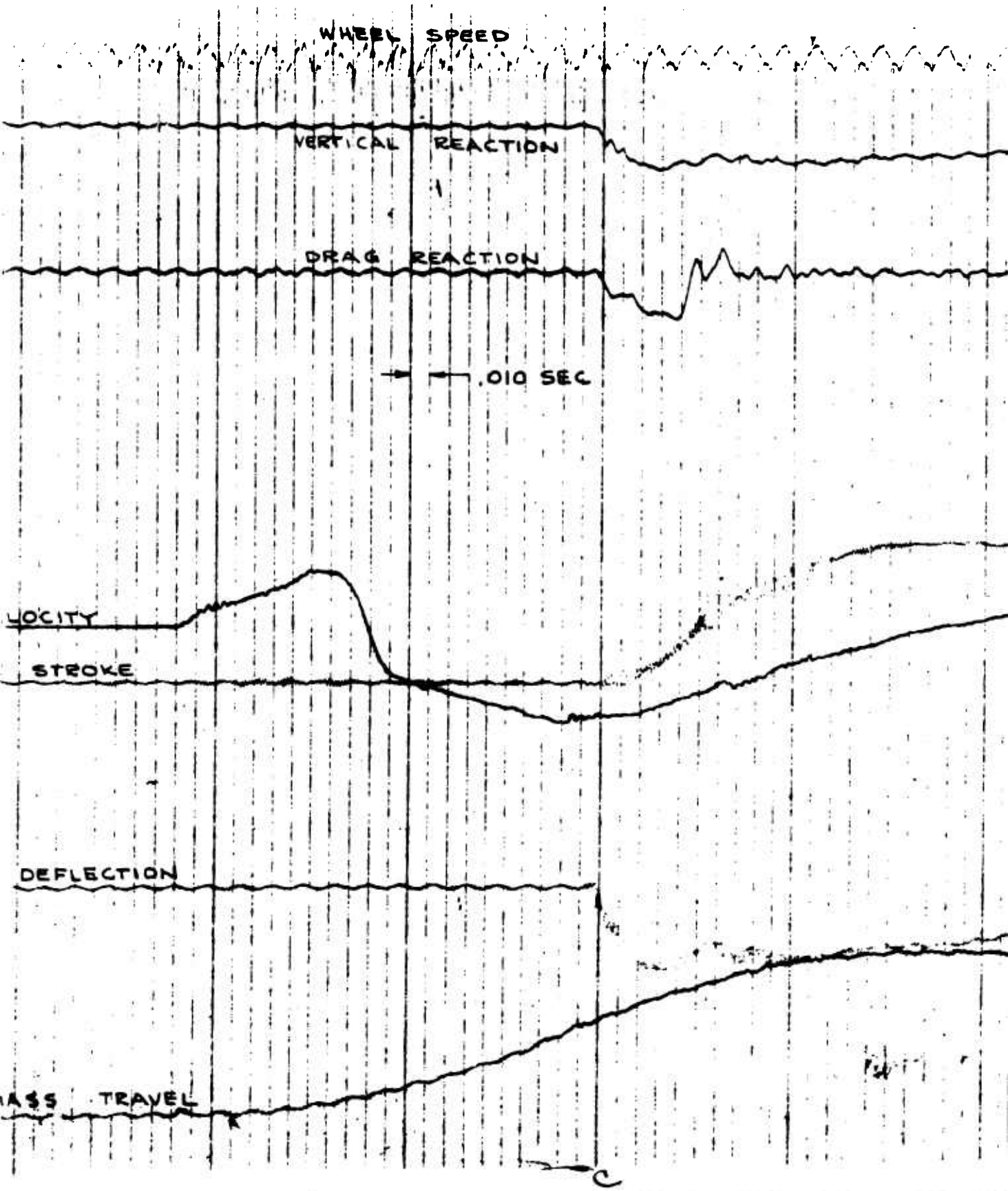
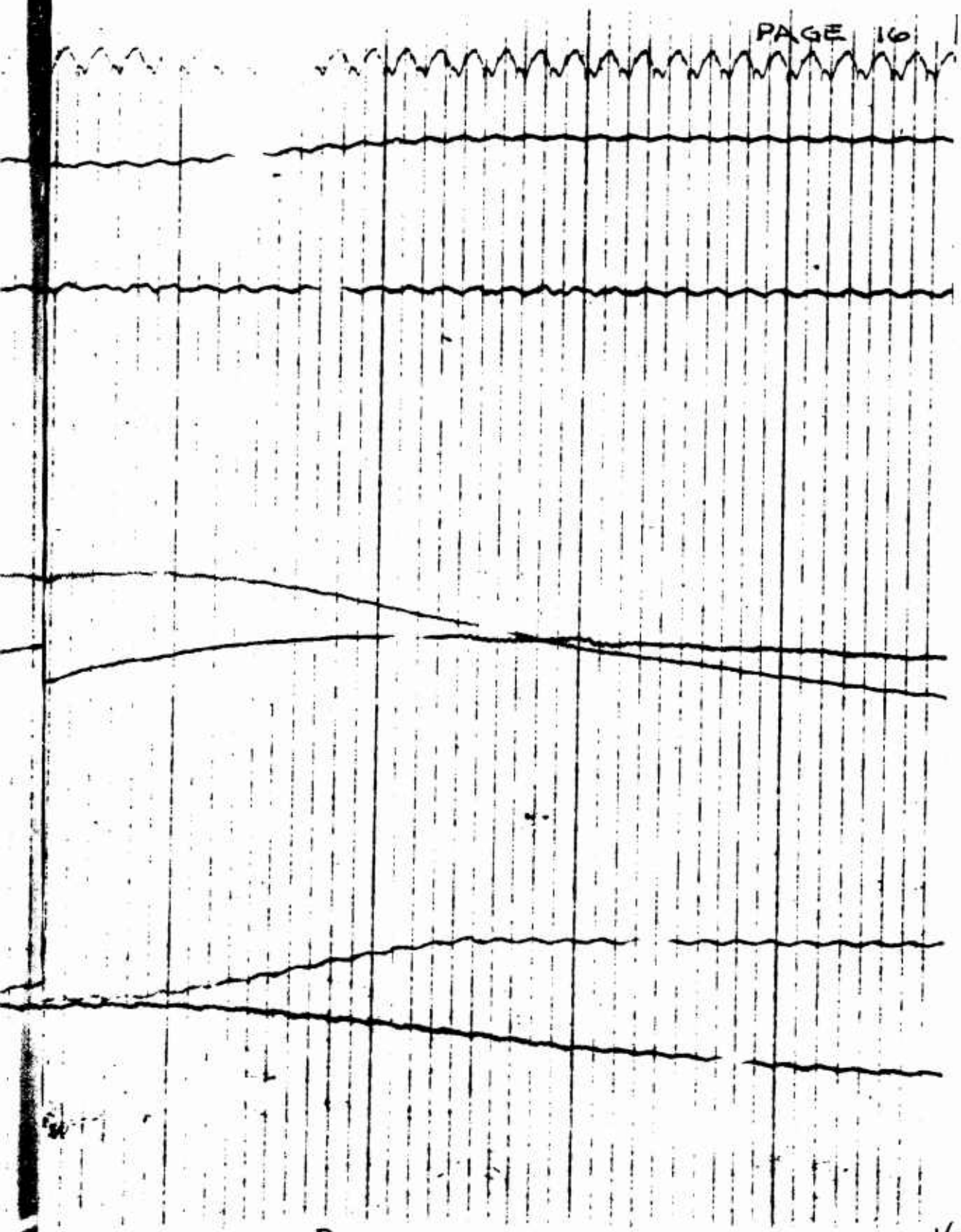
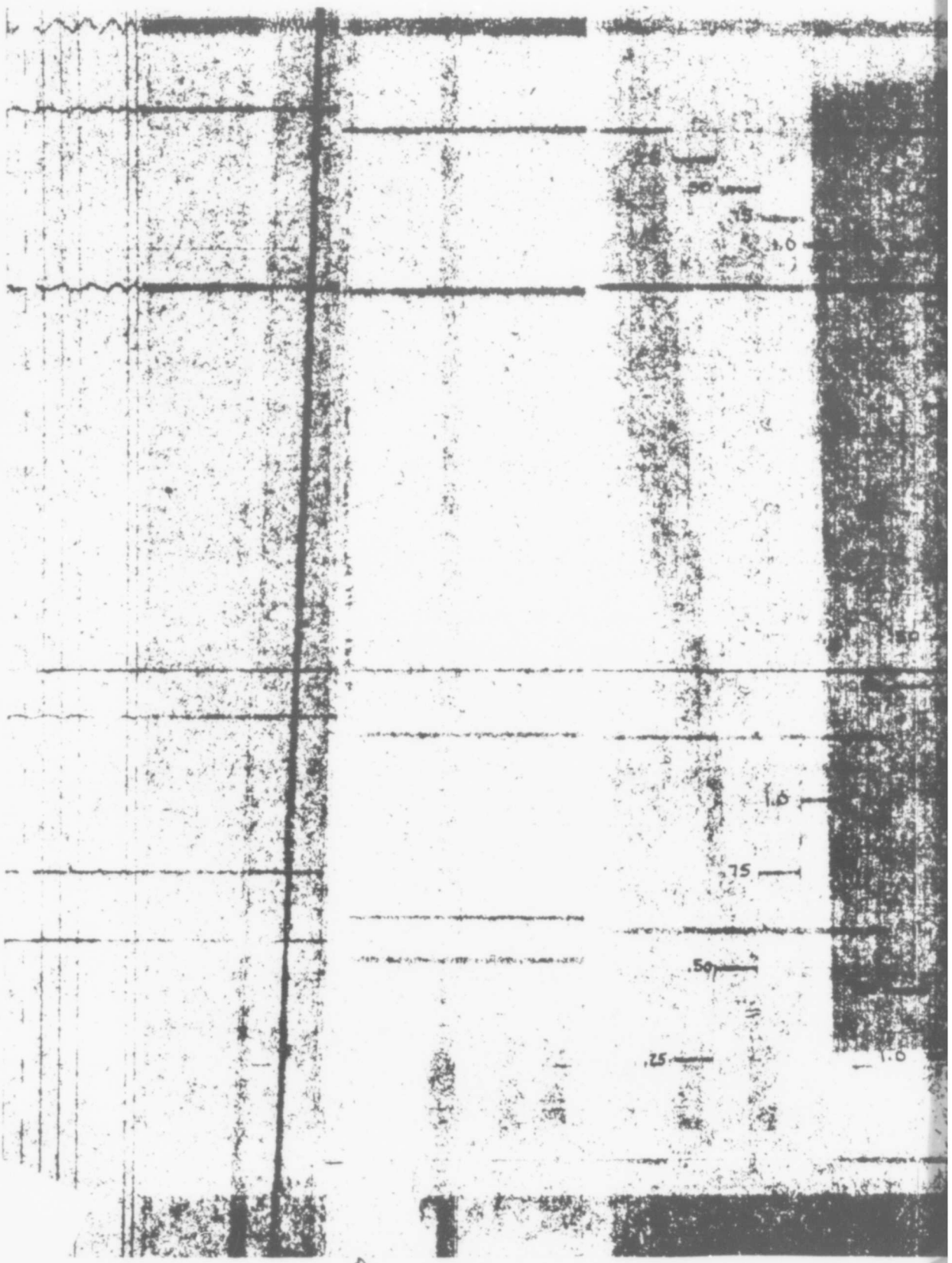

W
VER
DR
.75
1.0
5000
JIG VELOCITY
STRUT STROKE
TIRE DEFLECTION
6 8 5
MASS TRAVEL


WHEEL SPEED
VERTICAL REACTION
DRAG REACTION
.010 SEC
STROKE
DEFLECTION
TRAVEL





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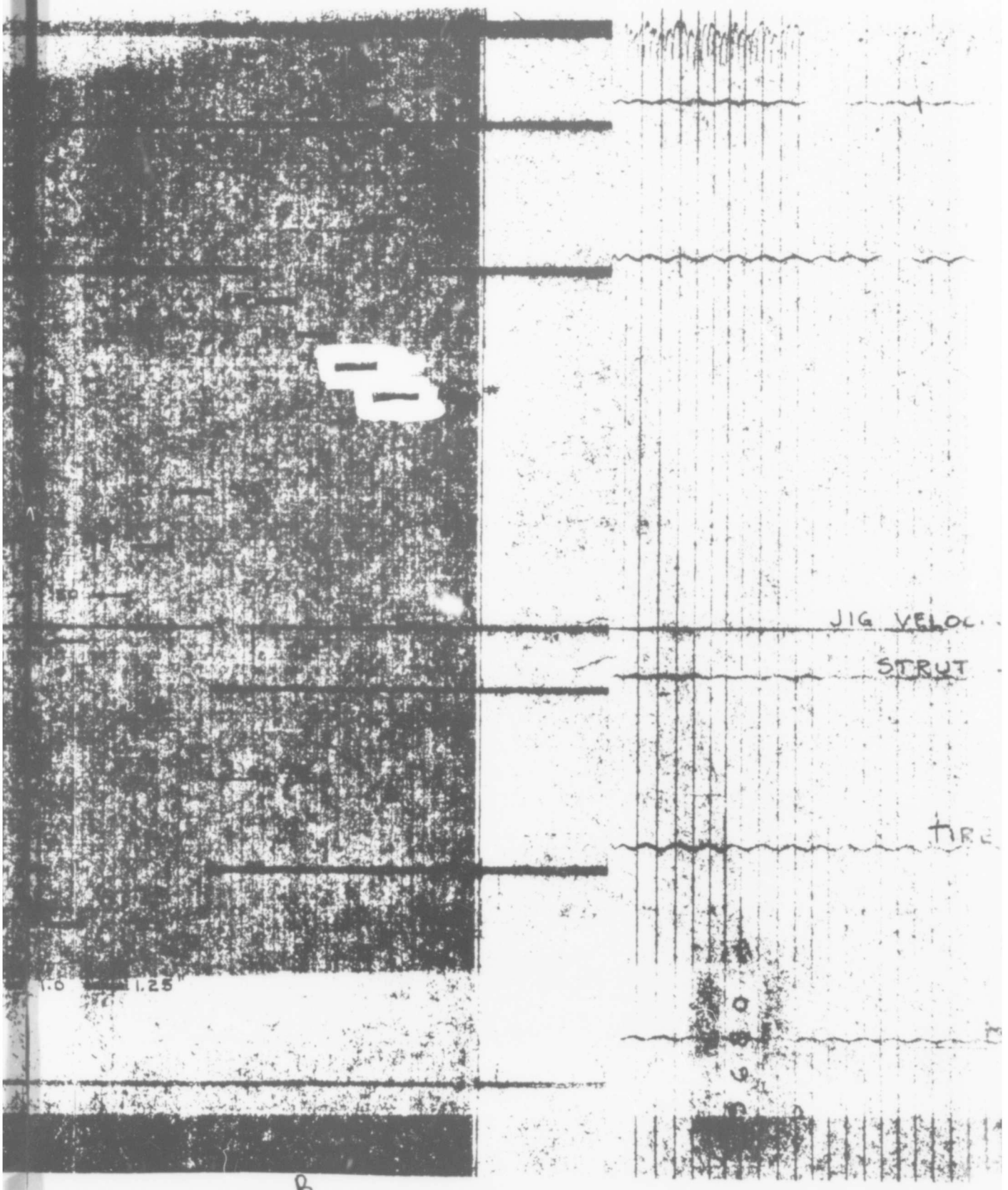
JIG VELOC
STRUT
1.0
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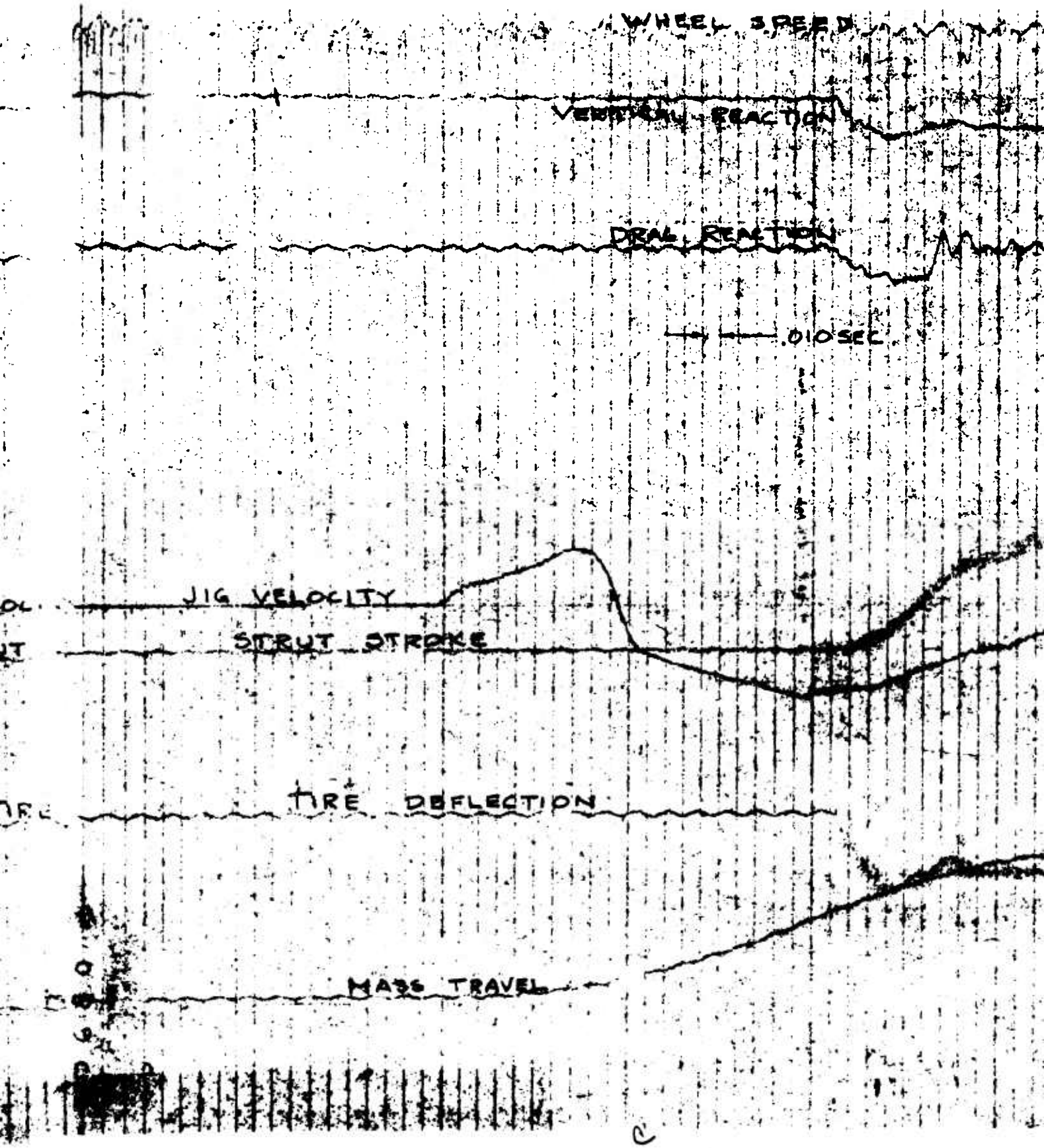
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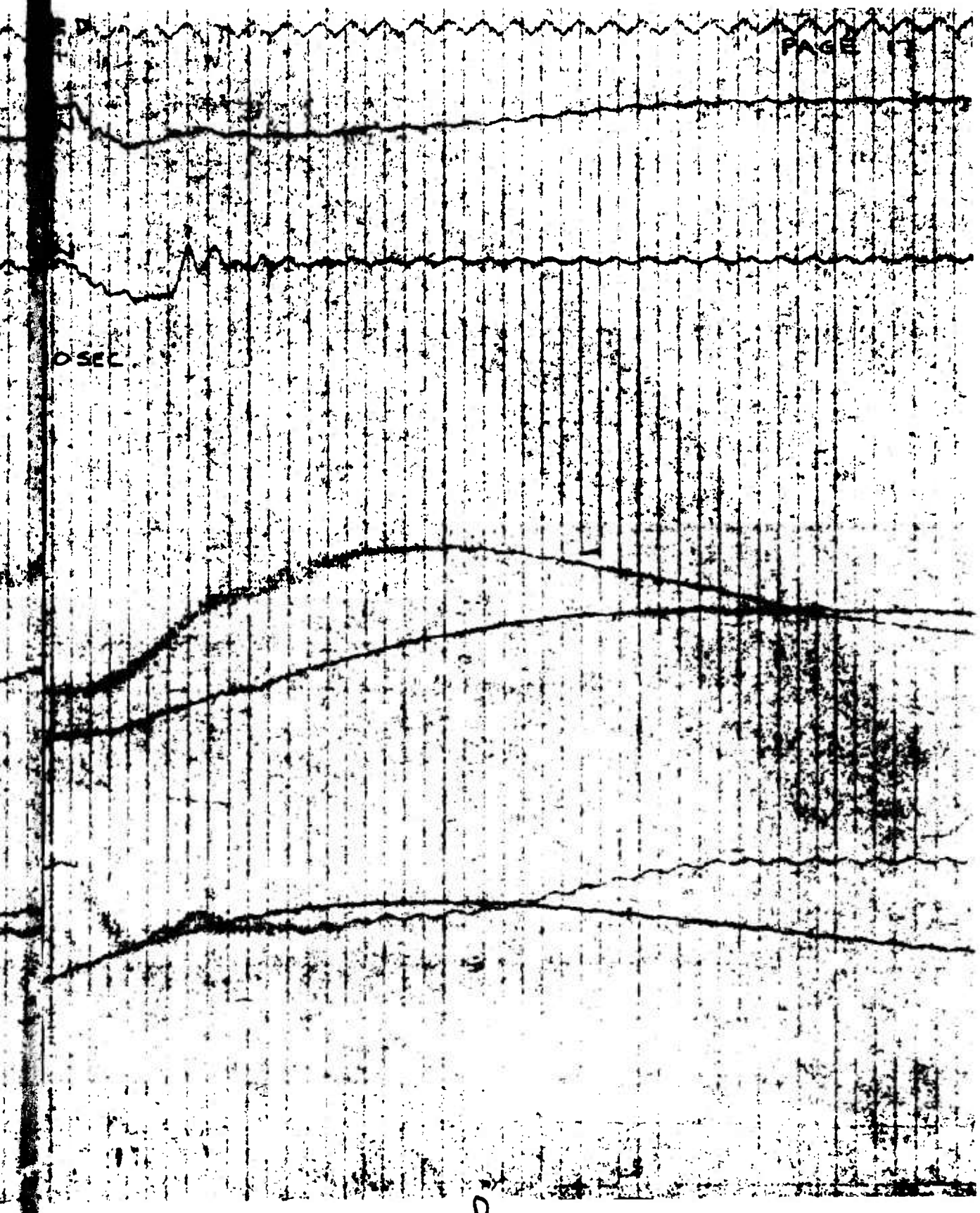
TIRE DEFLECTION
MASS TRAVEL


PAGE 17
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APPENDIX A

DROP TEST PROCEDURE 1511LTP-4, REVISION "A"
TABLE II DROP TEST REQUIREMENTS PAGE 13

TABLE II

DROP TEST REQUIREMENTS

Drop Series	Condition	A/P Weight (lbs)	Est Jig Weight (lbs)	Contact Velocity ± 2% (ft/sec)	Est. Drop Height (in)	Input Energy ± 5% (ft/lbs)	* Wheel Speed (rpm)	Static Weight For Inflation (lbs)	Tire Press (psi)	Max Vertical Ground Reaction (lbs)
1	Normal Ldg.	9,200	2,360	10	19.7	3,690	2,190	* *	155	6230
2	VTOL Ldg.	9,200	3,210	10	19.7	5,000	0	* *	155	8480
3	Normal Ldg.	12,500	3,200	6	7.8	1,800	2,546	* *	155	6230

* Based on 18" tire diameter.

** Use extend air pressure of 154 psig

APPENDIX B

WIRE CONFIRMING TEST REQUIREMENT DEVIATION

1511LTR-1	DROP TEST REPORT H. W. LOUD MACHINE WORKS, Inc. POMONA, CALIFORNIA	Appendix B

GA PLS YOUR CONNECTED [illegible] YOU [illegible] XXX SERVICE [illegible] DU
SAN DIEGO CALIF 7-25-53 MSG NO. 25
H. W. LOUD MACHINE WORKS
POMONA, CALIF
ATTN - MR. IRA SMITH

REF - TELEPHONE CONVERSATION BETWEEN HA[illegible]FIELD AND SMITH 7/20/53 REGARDING TEST REQUIREMENT DEVIATION FOR XV5A NOSE LANDING GEAR. THIS DEVIATION PERTAINS TO DROP TEST SERIES NO. I, NORMAL LANDING AND 9,200 LBS. APPLIED WEIGHT AT 10 FEET PER SECOND AND ALLOWS A VERTICAL GROUND REACTION NOT TO EXCEED 7,000 LBS TO OCCUR AFTER 4 INCHES OF STROKE, ON THE CONDITION THAT THE REACTION IS NOT CONCURRENT WITH THE MAXIMUM SPIN-UP OR MAXIMUM SPRING-BACK REACTION. DEVIATION GRANTED AS REF ABOVE.
RYAN AERONAUTICAL CO. [illegible] G. ROSE