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SANDIA SYSTEMATIC DECLASSIFICATION REVIEW	
1st Review Date: 9/22/98 Authority: ADC ADC Name: R B Cramer 2nd Review Date: 9/24/98 Authority: ADD Name: W Layne	Determination (Circle Numbers): 1 Classification Retained 2 Classification Changed to: U 3 Contains No DOE Classified Information 4 Coordinate With: 5 Contains UCAI? 6 Comments: OK FOR OPENNET

TX-41, ~~2-6~~ 3-2
Case No. 746.00
Project No. ET-6043
Completed 10/24/57

TO: DISTRIBUTION

Re: Evaluation Test of One Drogue Gun

Object of Test

The object of this test was to determine the characteristics of a Drogue gun with an MC-886 actuator attached, under actual firing conditions.

Summary of Results

This test consisted of three shots. In shot No. 1 the muzzle velocity of the projectile was 125 feet per second. The maximum pressure obtained in the explosive chamber was 1685 psi. In shot No. 2 the data is questionable. In shot No. 3 a simulated parachute container was used with a 5-foot pilot chute in its actual position. The pilot chute was ejected apparently 8 feet from its container. Maximum pressure at a station which was behind the projectile and in front of the explosive chamber was 1150 psi.

Authorization for Test

This test was requested by Division 1218 in a Work Order Authorization dated October 4, 1957. Mr. R. R. Neel was the consultant.

Acknowledgments

Division 1611 wishes to acknolwedge the participation and assistance of the following organizations in the tests of the Drogue gun assembly:

Section 1614-1 for instrumentation service
Section 1613-4 for T.V. coverage and other services
Section 5213-3 for camera coverage.

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Description of Test Item

The Drogue gun is a device used to eject the pilot chute of a TX-41 weapon. The Drogue gun is a cylindrical shell shaped item approximately 10 inches in length with an outside diameter of 1-3/4 inches and an inside diameter of 1-1/2 inches. A projectile of approximately 1-1/2 inches in diameter and 3 inches long is inserted into the Drogue gun and keyed with a stainless steel pin. A cable is attached to the forward end of the projectile and when the Drogue gun

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is fired this cable breaks a plastic seal at the tail of the TX-41 and pulls a pilot chute out. The explosive charge used in the Drogue gun is an MC-886 actuator. Figure 1 is a view of the Drogue gun and its components.

Instrumentation

Instrumentation for obtaining the muzzle velocity of the projectile consisted of two thin strips of tin foil mounted on a frame in front of the Drogue gun. The two strips of tin foil were placed in front of the Drogue gun in such a manner so that the distance between them was approximately 12 inches. Leads from a Berkeley counter were connected to the two strips of tin foil. When the projectile broke the first strip of tin foil, the counter would start. When the projectile broke the second strip of tin foil, the counter would stop. Figure 2 is a view showing the tin foil setup.

Instrumentation for obtaining the rate of pressure increase in the explosion chamber, and the maximum pressure in the explosion chamber consisted of a Statham pressure transducer, a filter, a system D consolidated amplifier, and a Minneapolis-Honeywell visicorder. A 535 oscilloscope with a Polaroid Land camera was also used in the first two shots to double check the pressure readings; but due to some undetermined failure, no picture was recorded on the oscilloscope in these shots. During the third shot the pressure was measured at a station which was behind the projectile and in front of the explosive chamber. The instrumentation for this test was the same as for the other two pressure tests, except that the 535 oscilloscope was not used. Hole A indicated on Figure 1 was where the first two pressure readings were obtained. Hole B indicated on Figure 1 was where the third pressure reading was obtained.

Procedure

A static pressure test was performed on the Drogue gun by Division 1614 before the item was fired to determine at what static pressure the 303 stainless steel shear pin sheared.

Shot No. 1 - Figure 2 is a view showing the complete setup of the system before the first shot. A 1/8 inch diameter 303 stainless steel shear pin was used in this test.

Shot No. 2 - The same procedure was used in shot No. 2 as in shot No. 1, except that the shear pin was of 1/8 inch standard drill rod material. Also, the tin foil strips used in shot No. 1 were not used in shot No. 2. In place of the tin foil, No. 40 break-wire was used. The Berkeley counter was attached in the same manner as in shot No. 1.

Shot No. 3 - In shot No. 3 a simulated parachute container was used with a 5-foot pilot chute in its actual position. Figures 3 and 4 are views showing the setup of the system before the third shot. Fastax camera

coverage was furnished on this test. A film of this shot is available and may be obtained by contacting D. G. Ahlstrom, Division 1611. Velocity measurements of the projectile were not recorded on this test. Pressure was measured at a station behind the projectile and in front of the explosive chamber in this test.

All shots were performed at the north end of the sled track in Area 3. Remote firing of the Drogue gun was executed from Building 6540. All recording instrumentation was also located in Building 6540.

Results

Static Pressure Test - The results of the static pressure test showed that the projectile retaining pin sheared between 1000 and 1050 psi.

Shot No. 1 - The time for the projectile to travel 12 inches as recorded on the Berkeley counter was 0.008132 second; therefore the velocity of the projectile was approximately 125 feet per second. The distance that the projectile was from the Drogue gun following shot No. 1 was 80 feet. Figure 5c is a view showing the pressure curve as recorded on the visicorder. Time durations and pressures obtained are also listed in Figure 5a. Pressure curves on Figure 5 are all one third actual size. Paper speed in these three figures was 25 inches per second. In Figure 5a, 9/10 inch equals 1000 feet.

Shot No. 2 - The time for the projectile to travel 12 inches as recorded on the Berkeley counter was 0.191467 second which is equal to 5.26 feet per second. It is believed that this velocity data is somewhat ambiguous. The only explainable reason for this ambiguous reading was that as mentioned in the Procedure of this report: A fine wire was used to trigger the Berkeley counter, and it is believed that during the second shot the projectile broke the first wire but missed the second wire. The second wire was probably broken as a result of the fire which follows the projectile. This is purely an assumption of the people present at the actual firing of shot No. 2. The distance that the projectile was from the gun following shot No. 2 was 52 yards. It was evident by observing the projectile following this test that it had struck something during this shot. It is believed that the projectile struck a rock and this had a factor in the distance that the projectile traveled. Figure 5b is a view showing the pressure curve as recorded on the visicorder. Data in Figure 5b is questionable due to the different shear pin material. In Figure 5 b, 0.85 inch equals 1000 feet.

Shot No. 3 - Figure 5c is a view showing the pressure curve as recorded on the visicorder from the pressure in front of the explosive chamber. The pilot chute was ejected approximately 8 feet from its container. The bottom part of the two sheets of 0.005 inch polyethylene did not tear as was expected because one of the wires from the projectile caught on the banding tool which broke the music wire used to tear the polyethylene. In Figure 5c, one inch equals 1000 psi.

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Remarks

Further tests on the Drogue gun will commence in the future. A method of obtaining the recoil force is in process. Further data on the pressure inside the Drogue gun and muzzle velocity will be obtained in succeeding tests.

D. G. Ahlstrom

Test Conducted by D. G. AHLSTROM - 1611-3

G. P. Barnett

Approved by G. P. BARNETT - 1611-3

DGA:1611-3:dr

Encs: Figs. 1, 2, 3, 4, and 5

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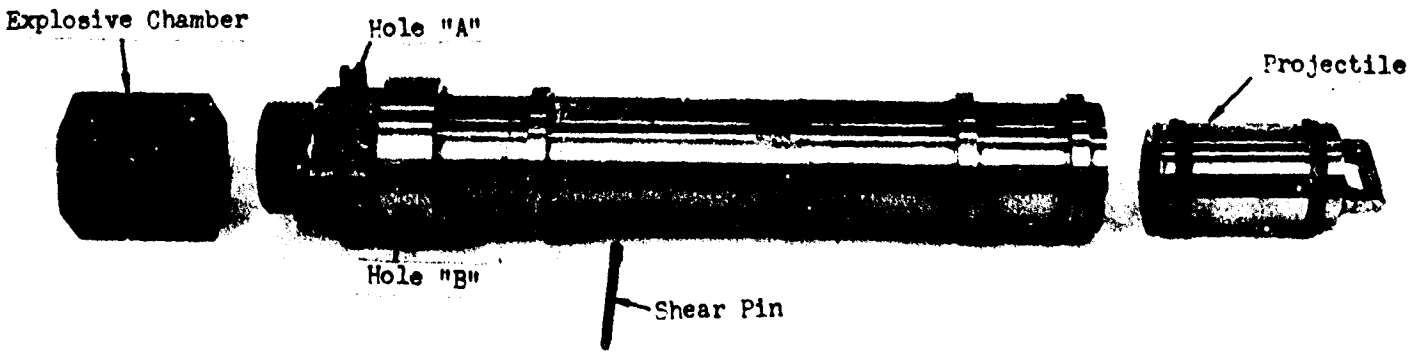

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FIG. 1 DROGUE GUN AND ITS COMPONENTS

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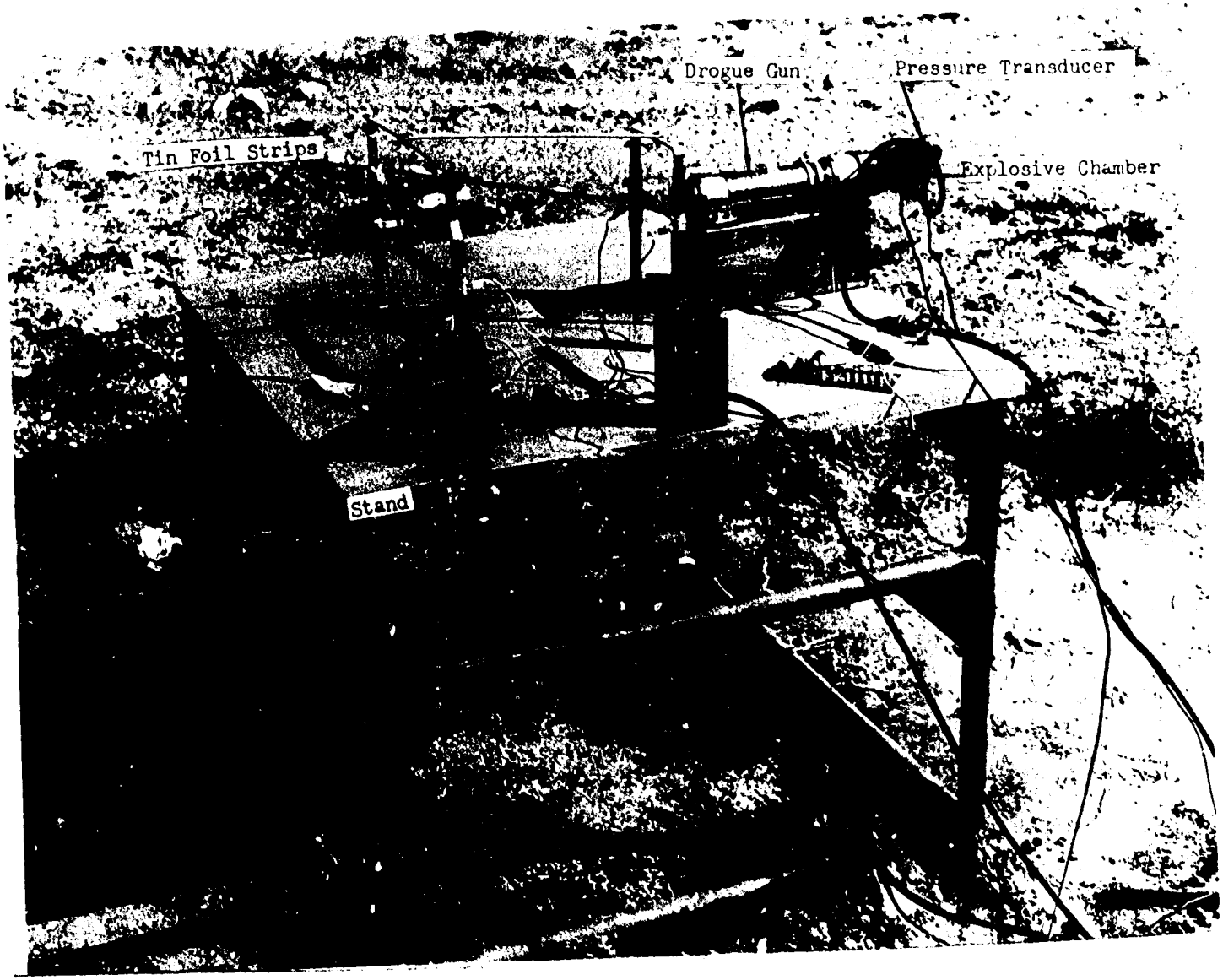

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FIGURE 2 - SETUP BEFORE SHOT - 1

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FIGURE 3 - SETUP BEFORE SHOT # 3

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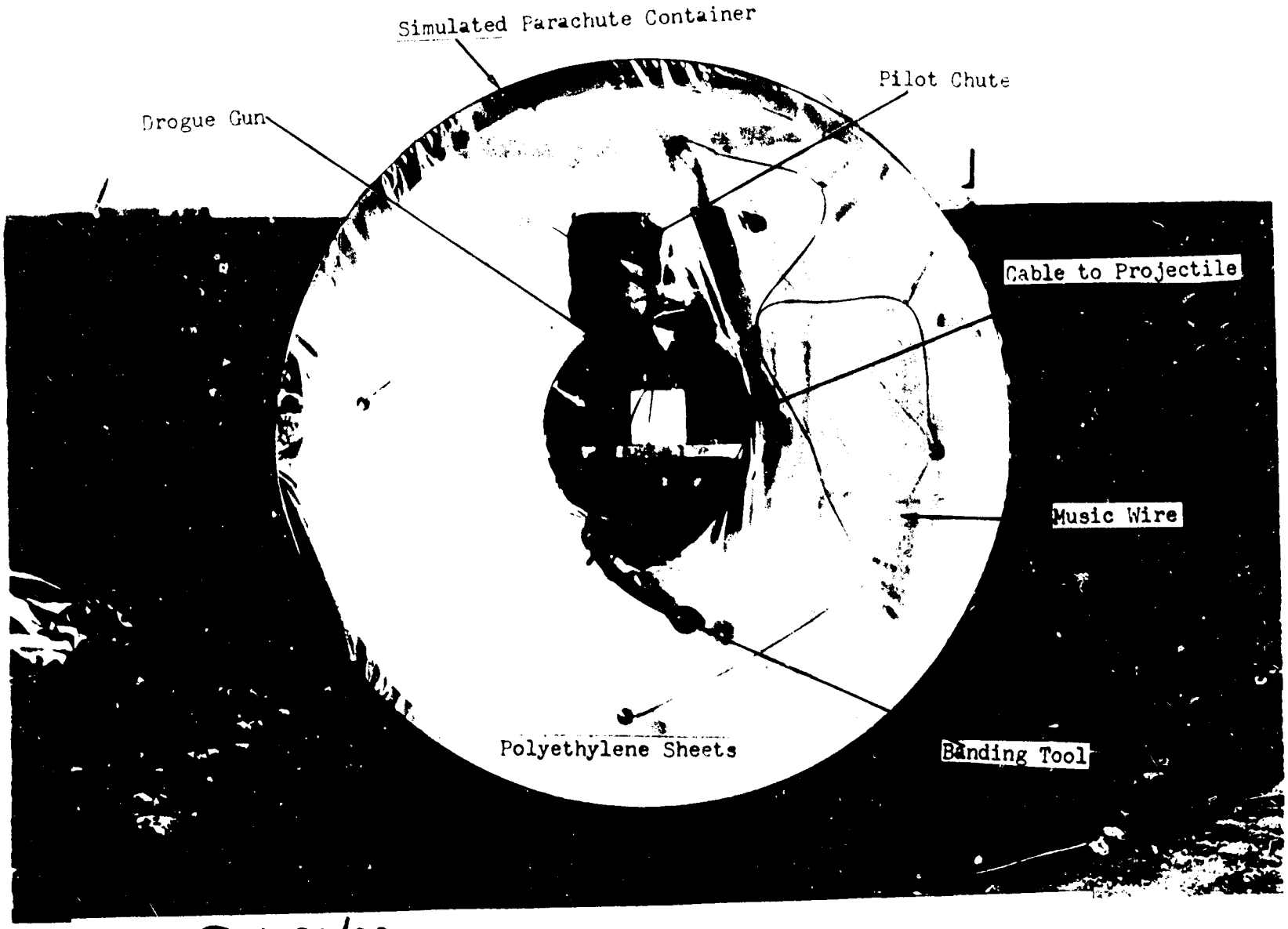

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FIGURE 4 - SETUP BEFORE SHOT # 3

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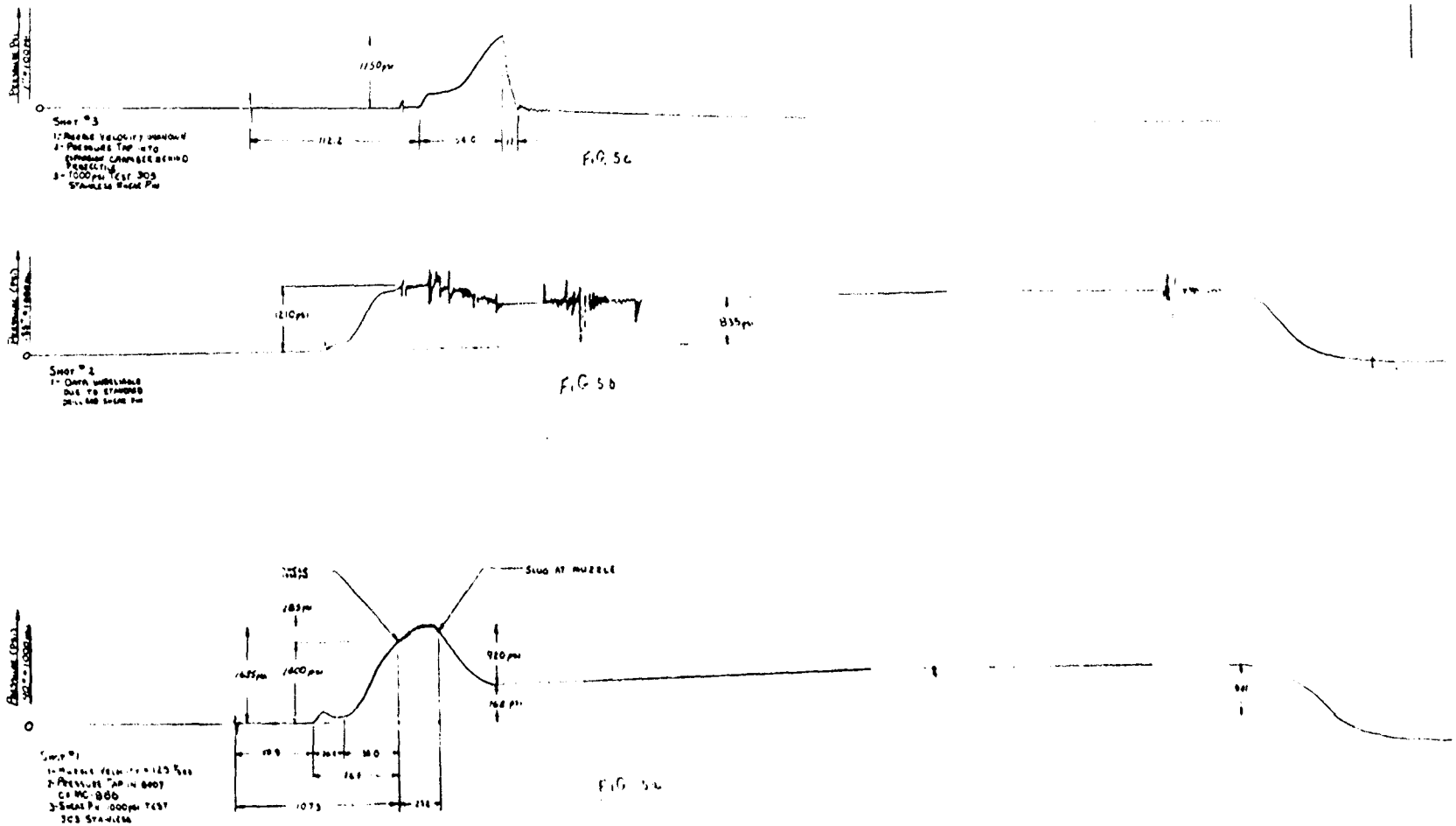

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FIGURE 5 - PRESSURE CURVE PROFILE FOR SHOT 1, 2 AND 3 (1/3 ACTUAL SIZE)

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