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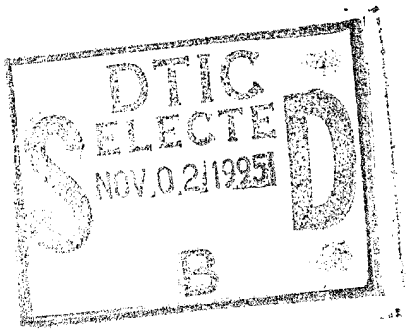
5.56-mm M856 TRACER MINI ROUND ROBIN STUDY

Lascelles A. Geddes



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US ARMY
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ARMAMENT RDE CENTER

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Close Combat Armaments Center

Picatinny Arsenal, New Jersey

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This report details the testing conducted to determine the amount of variation which exists in the 5.56-mm ballistic test results between U.S. Army Armament Research, Development and Engineering Center, Lake City Army Ammunition Plant, and Olin Ordnance, St. Marks, Florida. The testing included using the same 5.56-mm M856 tracer lot; test equipment; and 5.56-mm electronic pressures, velocity, and action time test barrels at all three sites and concluded that there was less than a 2% variation.

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OBJECTIVE

To determine the amount of variation that exists in 5.56-mm ballistic test results using the same U.S. Army Armament Research, Development and Engineering Center (ARDEC) test equipment at three various test site locations for hot, ambient, and cold temperature conditions.

BACKGROUND

On 9 December 1993, Lake City Army Ammunition Plant (LCAAP) submitted a Request For Waiver (RFW) M4S6000 (W0009-178-93) for acceptance of the 5.56-mm M856 tracer lot LC93K098-017 (referred herein as lot 017), which had failed the acceptance test criteria for minimum port pressure. Lake City AAP's Lot Failure Analysis Task Force concluded in the RFW M4S6000 (app A) that the failure was due to a variation in the port pressure, attributing the failure to test methods, and normal charge weight variation of the WC844T propellant. The U.S. Army Research, Development and Engineering Center approved RFW M4S6000, but was interested in determining how much variation actually existed in the electronic pressures, velocity, and action time (EPVAT) results from the testing conducted between the various test sites using the failed lot of M856 ammunition (lot 017), along with identical test equipment.

APPROACH

The approach taken in this study was to implement a test plan (app B) to determine the amount of variation that existed in ballistic test results using the same test equipment at ARDEC, LCAAP, and Olin Ordnance, St. Marks, Florida. The ballistic test results or characteristics which were examined were chamber pressure, port pressure, and velocity recorded for hot (+125° ± 2°F), ambient (70° ± 2°F), and cold (-65° ± 2°F) temperatures. The methods to obtain this information were developed following the procedures set forth in the Small Caliber Ammunition Test Procedures (SCATP) - 5.56 mm (Heavy Bullet), revision B, section 7, for EPVAT testing; which is the procedure used for all Government lot acceptance testing. The samples from the failed M856 lot (lot 017) were fired at each test site location through three 5.56 mm, 1-in. to 7-in. twist Kart Precision Barrel Corp. manufactured EPVAT barrels, each using the same Kistler 6203 piezoelectric transducers, as well as, two Kistler 5400 dual mode amplifiers. This base lining was aimed at reducing the amount of variation that could be attributed to the equipment, thereby, amplifying any variation due to the test setup at each test site.

AMMUNITION

The M856 tracer lot, LC-93K098-017, which consisted of 257,657 rounds, was rejected for failing to meet the minimum port pressure requirement. The 5.56-mm M856 Tracer Cartridge Specification, MIL-C-63990C, paragraph 3.8 states, "the mean port pressure minus three standard deviations shall not be less than 12,700 psi for sample cartridges conditioned to 70° ± 2°F." The lot recorded a port pressure of 12,560 psi for its initial lot acceptance test and retested with a port pressure of 12,590 psi. All other ballistic parameters met their requirements during both lot acceptance tests (app C).

The failed tracer lot was the 17th lot produced bearing the interfix number 098. The interfix number represents the processes or methods with which the M856 cartridges were manufactured. This M856 lot was produced with cases manufactured on the Small Caliber Ammunition Modernization Program (SCAMP) line, primed on the SCAMP line, contained Building 2 bullet assembly module (BAM) bullets, were plate loaded in Building 4, had dip tip I.D., and were 100% gaged and weighed (G&W). In addi-tion, two previous lots manufactured under interfix 098, loaded with the same propellant lot (49644) also failed to meet the minimum port pressure during lot acceptance, but both passed on their retest. The first of the two lots was lot LC-93E098-009, which initially recorded a port pressure of 12,360 psi and passed the retest with a value of 13,240, a difference of 880 psi. The second lot was LC-93F098-011, which recorded an initial port pressure value of 12,680 psi, with a retest value of 13,430 psi, which equates to a difference of 750 psi.

The WC844T propellant lot, 49644 (OMF9IG-049644), that was loaded into lot 017, recorded a port pressure of 13,398 psi when it was presented for lot acceptance at Olin Ordnance, St. Marks, Florida in July of 1991 (app C). This represents an approximately 800 psi difference between the propellant lot tested at St. Marks and the M856 tracer lot 017, which was tested for acceptance at LCAAP.

The M856 Mini Round Robin study attempted to determine the cause of the differences in test results occurring between LCAAP and Olin, St. Marks.

PORT PRESSURE RESULTS

The minimum port pressure required for the 5.56-mm M856 tracer cartridge is 12,700 psi for the corrected average minus three standard deviations. The average port pressure at the temperature extremes (+125° ± 2°F and -65° ± 2°F) shall not be less than 11,400 psi and shall not vary more than ±1,500 psi from the average port pressure at ambient. A total of nine ballistic tests were fired at an ambient temperature (70° ± 2°F) over the course of the M856 Mini Round Robin study. These nine tests consisted of firing the three Kart EPVAT barrels at three test sites, out of which only one test failed to meet the minimum requirement with an average port pressure minus

three standard deviations of 12,657 psi (table 1). Olin Ordnance, St. Marks, recorded the lowest overall port pressure with a site average of 13,164 psi. This value was 85 psi lower than the LCAAP average for port pressure, not 800 psi greater as was previously recorded during the WC844T propellant lot acceptance.

A statistical analysis conducted on the data by the Product Assurance and Test Directorate, Quality Production Branch, ARDEC, demonstrated that the actual difference/variation between Olin, St. Marks and LCAAP equates to 85 psi with a confidence interval of ±48.5 psi. The data from the M856 Mini Round Robin confirms that lot 017 does meet the minimum port pressure requirement and that there was very little variation in port pressure results among the test sites with ARDEC and Olin, St. Marks showing the largest variation with a difference of 2.32%, and an average variation of 0.57% between the three barrels. Figure 1 displays the average port pressure for each barrel at each test site, along with the upper and lower honest significant difference (HSD) limits, which demonstrate the amount of spread the data reflects at each site. Failures of HSD intervals to overlap indicate evidence of differences in average performance.

A major discrepancy noted while testing at LCAAP concerned the port pressure correction factor which is applied to each EPVAT test barrel prior to ballistic testing. Each test barrel must fire reference ammunition in order to qualify the barrel and establish range and equipment corrections, prior to firing the ammunition lot for testing. In order for the barrel to qualify, the average port pressure value must be within ±2,000 psi of the assessed port pressure value of the reference lot. The original assessed port pressure value for 5.56 mm, heavy bullet reference lot LC-87000R-011 (R011) was 13,414 psi; however, at LCAAP, the assessed value being used for EPVAT barrel corrections was 14,114 psi, a difference of 700 psi. This adjustment to the assessed value for port pressure had been stated in a September 1991, memorandum from Fire Control and Small Caliber Systems Division notifying all activities of the change (app D). Olin, St. Marks, however, was never notified of this important change until the ARDEC engineer conducting the M856 Mini Round Robin study at St. Marks in May 1994 provided a copy of this memorandum.

CHAMBER PRESSURE RESULTS

No notable differences were discovered in the chamber pressure results at each of the test site locations (table 2). The chamber pressure requirements for the M856 tracer cartridge is a maximum average of 55,000 psi at ambient temperatures (70° ± 2°F), a maximum of 61,000 psi for the average plus three standard deviations and a maximum individual chamber pressure reading of 61,000 psi. The specification requirement for the average chamber pressure at the temperature extremes (+125° ± 2°F and -65° ± 2°F) shall not vary more than 7,000 psi from the average chamber pressure and the average chamber pressure at hot temperatures (+125° ± 2°F) shall be no greater than 60,000 psi.

All of the tests conducted during the Mini Round Robin study were below the maximum requirements. The highest average chamber pressure recorded was for Kart barrel 6 fired at ARDEC, which was 1,030 psi above the grand mean for all chamber pressures recorded. The actual variation or difference between LCAAP and St. Marks was 726 psi ± 187 psi. Figure 2 displays the average chamber pressure for each barrel at each test site, along with the upper and lower HSD limits.

VELOCITY

The 5.56-mm M856 tracer cartridge requirement for the average velocity is 2,990 ±40 ft/s with a standard deviation no greater than 40. The requirement for the average velocity at the two temperature extremes (+125° ± 2°F and -65° ± 2°F) shall not decrease by more than 250 ft/s.

All of the velocities recorded during the M856 Mini Round Robin study were similar among the various test sites (table 3). Olin, St. Marks recorded higher velocities for each barrel as seen in figure 3. The actual variation between LCAAP and Olin, St. Marks was 24 ft/s ± 7.6 ft/s, with the amount of variation between the test sites and the barrels being less than 1%, respectively. Two out of the three barrels tested at Olin, St. Marks exceeded the maximum M856 velocity requirement of 3,030 ft/s. However, each of the three barrels failed to qualify at Olin, St. Marks using 5.56 mm, reference lot R011. Each barrel went through the qualification procedure twice and both times failed to qualify for velocity. Testing was conducted with the non-qualified barrels anyway since these barrels had already been used at both ARDEC and LCAAP.

Technicians at Olin, St. Marks suggested that the distance between LCAAP's velocity screens be checked, but this scenario seems unlikely since the ARDEC and LCAAP test results demonstrate similar velocities. It was also noted that Olin, St. Marks uses Ohler Model 55 velocity screens, which are set 100 ft apart, centered at 78 ft, and are bolted to the floor. Lake City AAP uses ECI Model 6100 velocity screens, set 100 ft apart, centered at 78 ft, and are not fixed to the floor. Another issue that was discussed was that the value for velocity (2,983 ft/s) for reference lot R011 is assessed too high. Of the 260 reference rounds fired during the M856 Mini Round Robin study, through the same three Kart barrels, the average positive correction factor for velocity was 29.7 ft/s, where the SCATP cites a requirement of ±35 ft/s for barrel qualification.

ADDITIONAL TESTING

In addition to the testing outlined in the test plan (app B), further testing was performed on the failed lot at LCAAP and at Olin, St. Marks. After all testing had been completed at LCAAP, lot 017 was again fired through the ARDEC supplied test barrels; however, this time LCAAP transducers and charge amplifiers were used. The results in table 4 show that the velocities for each barrel were consistently lower, an

average of 9.7 ft/s, with the LCAAP test equipment than when compared with the ARDEC test equipment. Likewise, the port pressure was higher by an average of 226.6 psi with the LCAAP transducers than with the ARDEC transducers, which equates to a 1.7% increase. The chamber pressure was varied, but averaged out to a decrease of 289.6 psi, which is less than 1%. This test was done only at ambient temperatures.

After testing had been completed at Olin, St. Marks, additional testing was performed with lot 017 to compare an H-S Precision Inc. manufactured EPVAT barrel used in conjunction with St. Marks test equipment. The data located in table 5 displays those results which show that the ARDEC barrels shot much higher than the H-S barrel; however, only a 10-round sample was shot for this test based on ammunition availability.

This additional testing did demonstrate some variation, but on an overall scale the amount was less than 2.0%. This variation, like the small amount noted earlier, could possibly be attributed to experimental/operator error.

DISCREPANCIES

As the 5.56-mm M856 Round Robin study progressed from one test site to another, discrepancies in the test setup between sites were discovered. One of the major discrepancies dealt with the amount of torque applied to fasten the transducers to the barrel. The torque value required for tightening the Kistler 6203 transducer to the test barrel should be 130 inch-pounds (in.-lb) according to the 5.56 mm, SCATP. During the M856 Round Robin study, however, it was discovered that none of the test facilities used this value. A torquing force of 120 in.-lb was used at ARDEC, whereas, LCAAP and Olin, St. Marks both use a force of 105 in.-lb to torque their transducers, based on Kistler's recommendation to Fire Control and Small Caliber Systems Division, dated 16 April 1985 (app E). The amount of torque placed on the transducers has been known to influence the ballistic results obtained.

The charge amplifier setup also varied at each test location. The U.S. Army Armament Research, Development and Engineering Center sets the sensitivity range on the Kistler 5004 dual mode charge amplifier to read the voltage output directly in terms of pounds per square inch (psi) and the pressures are then read from an oscilloscope. Lake City AAP also uses the Kistler 5004 dual mode charge amplifier, but is set up to read the data directly from the transducer voltages and uses the Ohler System 82 ballistic computer to convert the data into pressure (psi). The Kistler 5004 dual mode charge amplifier requires a filter, which defines the pressure peak and averages the ballistic data. The U.S. Army Armament Research, Development and

Engineering Center uses the NATO approved 33 kHz filter, whereas, LCAAP uses a 180 kHz filter. The 180 kHz filter provides a higher reading, as much as 1,000 psi, by filtering out more of the noise. Whereas, Olin, St. Marks uses the Model 504E Charge Amplifier, an internal charge amplifier located in the Ohler System 82, which is set to the specific transducer sensitivity value and the frequency of the filter used was not known. The test technicians at St. Marks were unfamiliar with how to set up their Ohler System with external charge amplifiers, so the ARDEC charge amplifiers used in testing at ARDEC and LCAAP were not used. Both LCAAP and Olin, St. Marks use version 1.19 of the Ohler Slowfire software; however, LCAAP uses different setup parameters with the software due to the charge amplifier setup/transducer calibration differences.

The methods that the gunners at LCAAP and Olin, St. Marks follow also vary. The Olin, St. Marks gunners follow the prescribed SCATP procedure for the treatment of each test round that LCAAP gunners use (180°, stop, 180°). However, the Olin, St. Marks practice is to seat the round fully with thumb pressure; whereas, the LCAAP gunners seat the round with the bolt. In addition, the receivers at LCAAP have a "V" machined into the bolt which makes it easier to place the round in the chamber while keeping the bullet upwards.

Olin, St. Marks' weapon bays are more climate controlled than the gun bays at LCAAP. The weapon bays at Olin, St. Marks are conditioned to 70° ± 2°F eliminating the need to keep the test rounds in the holding boxes. Each weapon bay at Olin, St. Marks has a temperature controlled oven in it allowing the gunner to remove a single round from the oven and place it in the barrel. At LCAAP, the gunner must remove five rounds at a time from the temperature conditioning chamber, place them in a holding box and walk approximately 80 ft to the gun bay.

CONCLUSIONS

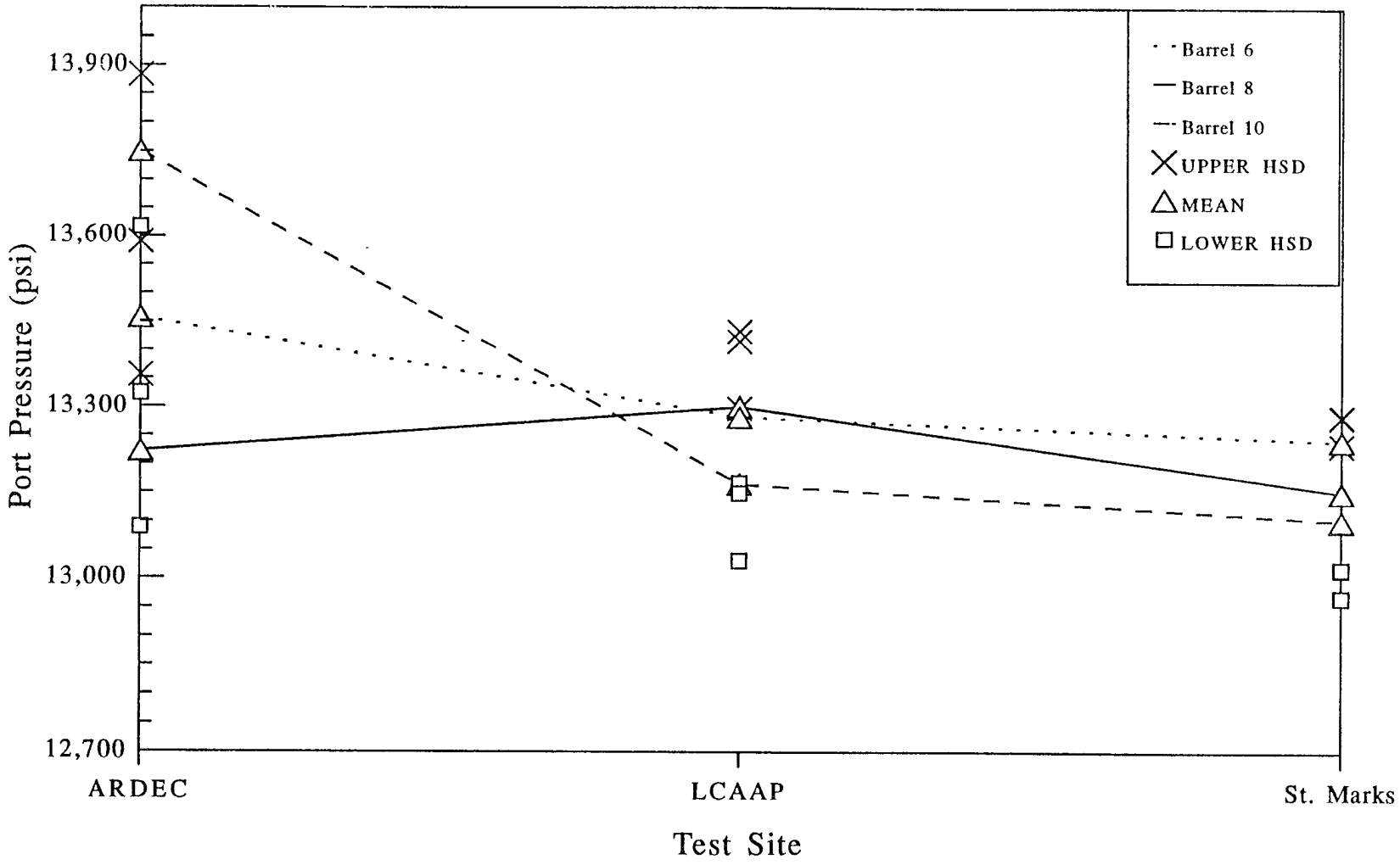
The 5.56-mm M856 Tracer Mini Round Robin consisted of firing approximately 1,000 rounds through multiple barrels with the same test equipment to determine the amount of variation that exists in ballistic results between test facilities at the U.S. Army Armament Research, Development and Engineering Center (ARDEC), Lake City Army Ammunition Plant (LCAAP), and Olin Ordnance, St. Marks, Florida.

The data that has been presented demonstrates that the variation in ballistic data due to equipment set-up between ARDEC, LCAAP, and Olin, St. Marks is negligible. Even with the number of discrepancies in test setup and equipment, the largest variation discovered was less than 2% and was attributed to EPVAT barrels, 006 and 0l0, and test locations, ARDEC and LCAAP. This 2% variation could be attributed to

set up and normal experimental error. The variation between port pressure results during the lot acceptance testing of the ammunition lot and the propellant lot equates to a 6% variation. This variation could be attributed to the chemical reaction which occurs with the ignition of the propellant in the cartridge upon firing.

RECOMMENDATIONS

Even though very little variation was found between the test sites, several discrepancies were discovered which could lead to larger variations in the future. This office will investigate the affects that various torque values have on barrels, as well as, ballistic results. The same should be done for the varying filter frequency on the charge amplifiers and the difference in weapon bay configuration between Lake City Army Ammunition Plant and Olin, St. Marks. In addition, this office will seek to assess reference lot R011 to determine that the values posted to that lot are valid.

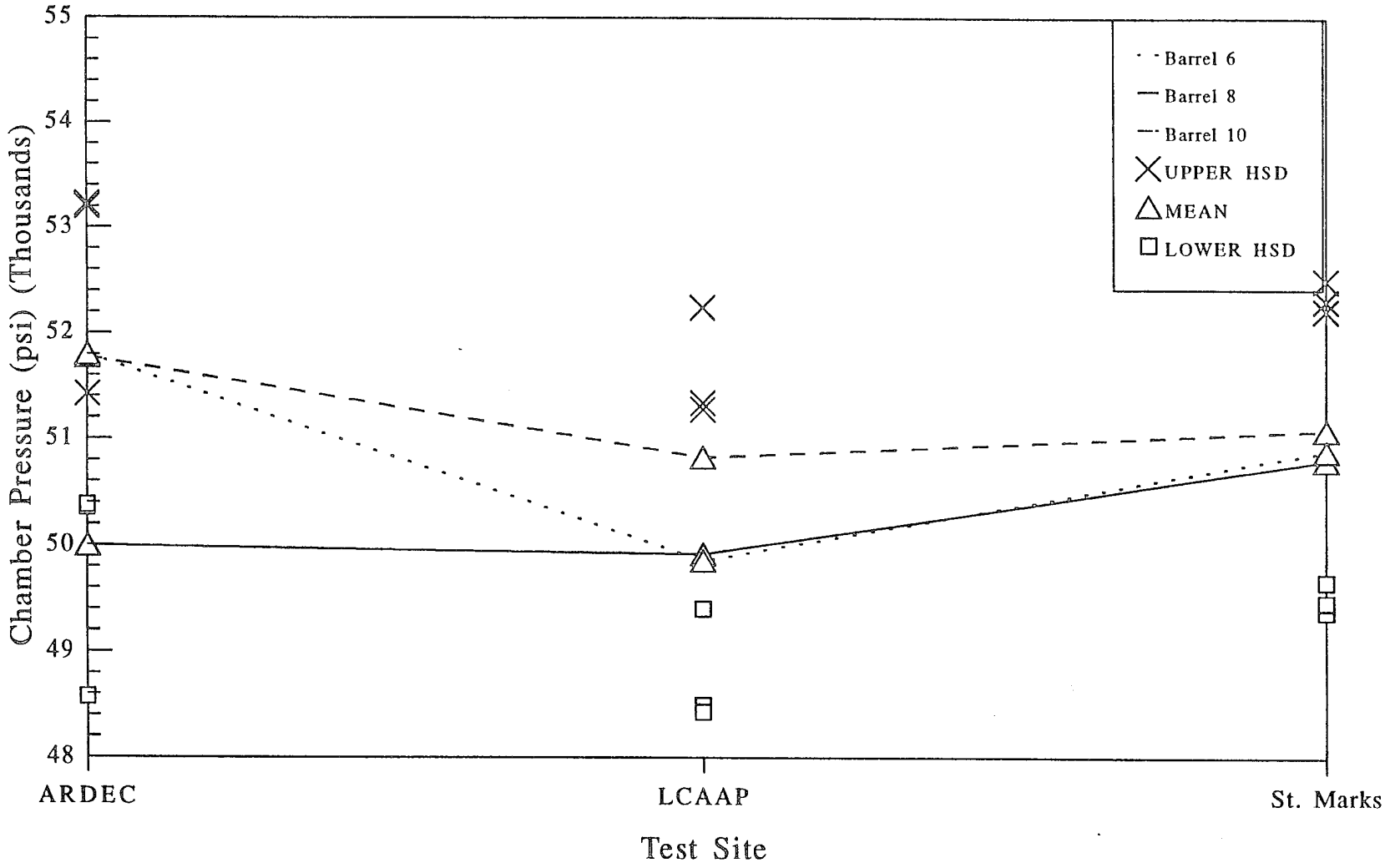


*Corrected Average

HSD=Honest Significant Difference

HSD Delta = 133.23

Figure 1
Site by barrel interaction for port pressure*

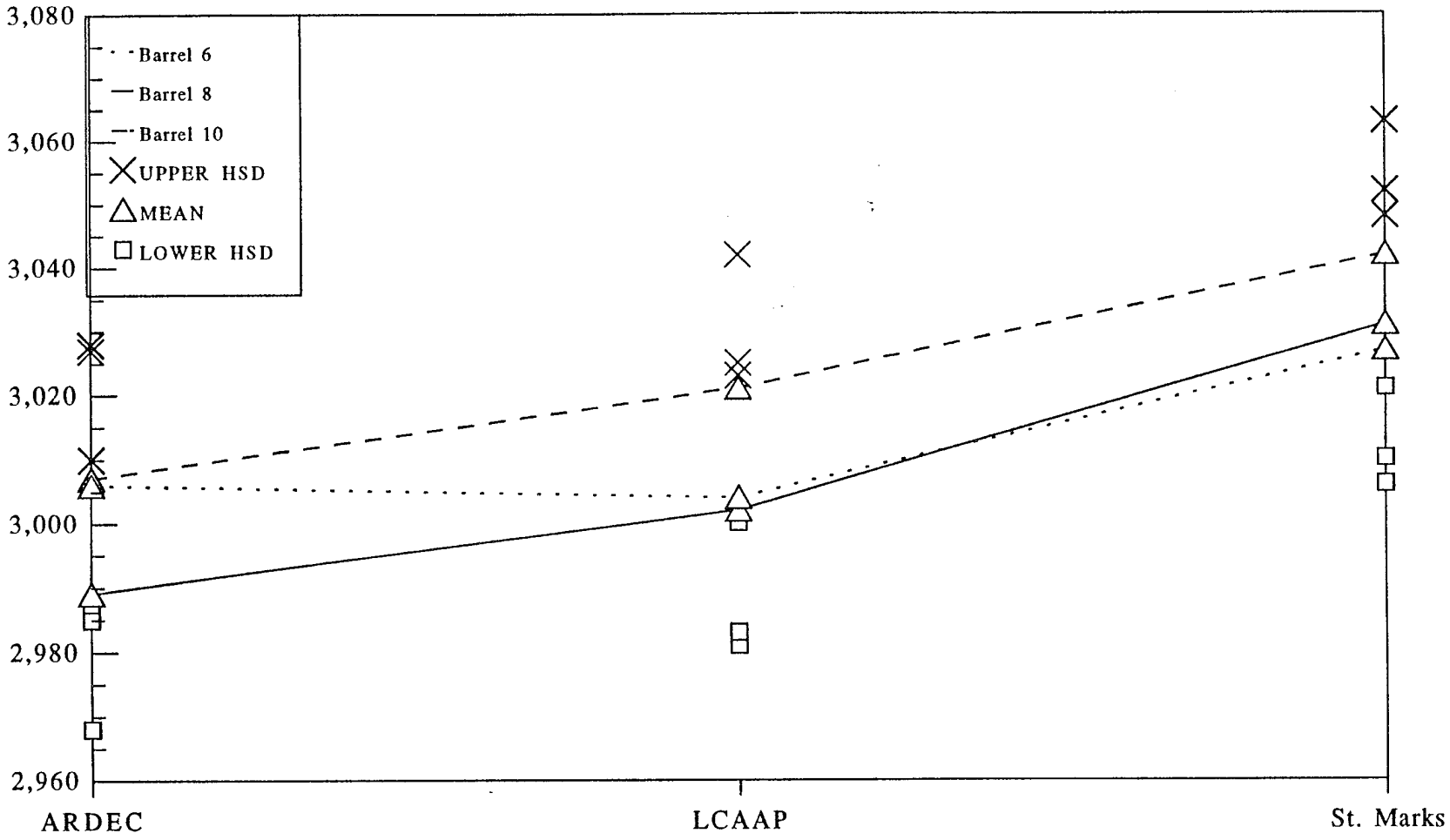


*Corrected Average

HSD=Honest Significant Difference

HSD Delta = 1,422.15

Figure 2
Site by barrel interaction for chamber pressure*



*Corrected Average

HSD=Honest Significant Difference

HSD Delta = 20.98

Figure 3
Site by barrel interaction for velocity*

Table 1
5.56-mm M856 mini round robin, lot LC-93K098-017, test results on port pressure*

TEST LOCATION	BARREL NO. #	AVERAGE @ AMB	SD	AVG + 3SD @ AMB	AVG - 3SD @ AMB	MAX PORT @ AMB	MIN PORT @ AMB	EX VAR @ AMB	PORT VAR @ +125F	PORT VAR @ -65F	Corr. Factor
ARDEC	006	13457	129	13844	13070	13750	13270	480	351	-270	-850
LCAAP	006	13282	88	13545	13019	13435	13045	390	216	-561	-976
ST. MARKS	006	13241	89	13508	12974	13448	13106	342	138	-599	-484
BRL 006	***AVGs***	***13327***	***102***	***13632***	***13021***	***13544***	***13140***	***404***	***235***	***-477***	***-770***
ARDEC	008	13222	193	13802	12642	13592	12872	720	-186	-241	-1088
LCAAP	008	13301	153	13760	12841	13594	13084	510	141	-521	-436
ST. MARKS	008	13150	116	13498	12802	13319	12946	373	54	-540	-534
BRL 008	***AVGs***	***13224***	***154***	***13687***	***12762***	***13502***	***12967***	***534***	***3***	***-434***	***-686***
ARDEC	010	13750	188	14313	13187	14224	13464	760	67	-19	-736
LCAAP	010	13164	97	13455	12873	13297	12957	340	366	-178	191
ST. MARKS	010	13101	120	13461	12741	13296	12849	447	173	-501	-406
BRL 010	***AVGs***	***13338***	***135***	***13743***	***12934***	***13606***	***13090***	***516***	***202***	***-233***	***-317***
ARDEC	AVERAGE	13476	170	13986	12966	13855	13202	653	77	-177	-891
LCAAP	AVERAGE	13249	113	13587	12911	13442	13029	413	241	-420	-407
ST. MARKS	AVERAGE	13164	108	13489	12839	13354	12967	387	122	-547	-475
PERCENT DIFFERENCES BETWEEN LOCATIONS											
ARDEC vs. LCAAP		1.69%		2.86%	0.43%	2.98%	1.31%				
ARDEC vs. ST. MARKS		2.32%		3.56%	0.98%	3.62%	1.78%				
LCAAP vs. ST. MARKS		0.64%		0.72%	0.56%	0.65%	0.47%				

*NOTE: All values corrected using 14,114 psi

Table 2
5.56-mm M856 mini round robin, lot LC-93K098-017, test results on chamber pressure*

TEST LOCATION	BARREL NO. #	AVERAGE @ AMB	SD	AVG + 3SD @ AMB	AVG - 3SD @ AMB	MAX ChP @ AMB	MIN ChP @ AMB	EX VAR @ AMB	ChP VAR @ +125F	ChP VAR @ -65F	Corr. Factor
ARDEC	006	51800	1638	56714	46886	54784	49024	5760	1959	715	684
LCAAP	006	49853	1092	53129	46577	51546	47542	4005	6405	-517	-864
ST. MARKS	006	50888	1355	54953	46823	53425	47380	6045	3478	-66	-222
BRL 006	***AVGs***	***50847***	***1362***	***54932***	***46762***	***53252***	***47982***	***5270***	***3947***	***44***	***-134***
ARDEC	008	49996	2488	57461	42531	54087	42687	11400	2474	1487	487
LCAAP	008	49915	1128	53299	46530	51645	47780	3865	3403	-1573	348
ST. MARKS	008	50797	1036	53906	47689	53070	48642	4428	3042	-1698	-145
BRL 008	***AVGs***	***50236***	***1551***	***54889***	***45583***	***52934***	***46370***	***6564***	***2973***	***-595***	***230***
ARDEC	010	51775	1282	55622	47928	54151	49271	4880	847	-275	971
LCAAP	010	50822	1292	54698	46947	52832	47957	4875	2509	-2398	-272
ST. MARKS	010	51083	1151	54537	47630	52828	49070	3758	3301	-883	1733
BRL 010	***AVGs***	***51227***	***1242***	***54952***	***47502***	***53270***	***48766***	***4504***	***2219***	***-1185***	***811***
ARDEC	AVERAGE	51190	1803	56599	45782	54341	46994	7347	1760	642	714
LCAAP	AVERAGE	50197	1171	53709	46685	52008	47760	4248	4106	-1496	-263
ST. MARKS	AVERAGE	50923	1181	54465	47381	53108	48364	4744	3274	-882	455
PERCENT DIFFERENCES BETWEEN LOCATIONS											
ARDEC vs. LCAAP		1.94%		5.11%	1.93%	4.29%	1.60%				
ARDEC vs. ST. MARKS		0.53%		3.77%	3.37%	2.27%	2.83%				
LCAAP vs. ST. MARKS		1.45%		1.41%	1.49%	2.12%	1.27%				

*NOTE: All values are corrected averages.

Table 3
5.56-mm M856 mini round robin, lot LC-93K098-017, test results on velocity*

TEST LOCATION	BARREL NO. #	AVERAGE @ AMB	SD	AVG + 3SD @ AMB	AVG - 3SD @ AMB	MAX VEL @ AMB	MIN VEL @ AMB	EX VAR @ AMB	VEL VAR @ +125F	VEL VAR @ -65F	Corr. Factor
ARDEC	006	3006	21	3070	2941	3034	2961	73	58	-44	19
LCAAP	006	3004	19	3060	2948	3042	2968	74	60	-40	22
ST. MARKS	006	3027	28	3112	2943	3071	2953	118	68	-54	38
BRL 006	***AVGs***	***3012***	***23***	***3081***	***2944***	***3049***	***2961***	***88***	***62***	***-46***	***26***
ARDEC	008	2989	23	3057	2921	3043	2952	91	52	-17	43
LCAAP	008	3002	20	3063	2942	3038	2957	81	54	-62	23
ST. MARKS	008	3031	18	3086	2976	3065	2996	69	62	-65	36
BRL 008	***AVGs***	***3007***	***20***	***3069***	***2946***	***3049***	***2968***	***80***	***56***	***-48***	***34***
ARDEC	010	3007	20	3066	2948	3052	2967	85	20	-24	20
LCAAP	010	3021	20	3082	2959	3054	2977	77	52	-74	24
ST. MARKS	010	3042	22	3109	2975	3093	3005	88	66	-58	42
BRL 010	***AVGs***	***3023***	***21***	***3086***	***2961***	***3066***	***2983***	***83***	***46***	***-52***	***29***
ARDEC	AVERAGE	3001	21	3064	2937	3043	2960	83	43	-28	27
LCAAP	AVERAGE	3009	20	3068	2950	3045	2967	77	55	-59	23
ST. MARKS	AVERAGE	3033	23	3102	2965	3076	2985	92	65	-59	39
PERCENT DIFFERENCES BETWEEN LOCATIONS											
ARDEC vs. LCAAP		0.28%		0.13%	0.44%	0.05%	0.25%				
ARDEC vs. ST. MARKS		1.08%		1.22%	0.94%	1.08%	0.83%				
LCAAP vs. ST. MARKS		0.80%		1.10%	0.51%	1.03%	0.58%				

*NOTE: All values are corrected averages.

Table 4
5.56-mm M856 mini round robin, lot LC-93K098-017,
transducer/test set-up comparison

	Velocity (fps)	Standard Deviation	Port Pressure (psi)	Standard Deviation	Chamber Pressure (psi)	Standard Deviation
BARREL #006						
ARDEC TRANSDUCERS	3004	19	13282	88	49853	1092
LCAAP TRANSDUCERS	2998	24	13478	75	49625	1293
DIFFERENCES	-6		196		-228	
BARREL #008						
ARDEC TRANSDUCERS	3002	20	13301	153	49915	1128
LCAAP TRANSDUCERS	2995	19	13473	86	50173	1240
DIFFERENCES	-7		172		258	
BARREL #010						
ARDEC TRANSDUCERS	3021	20	13164	97	50822	1292
LCAAP TRANSDUCERS	3005	20	13476	96	49923	1073
DIFFERENCES	-16		312		-899	
AVERAGES	-9.67		226.67		-289.67	

*NOTE: All ballistic values are averages.

Table 5
5.56-mm M856 mini round robin, lot LC-93K098-017,
Kart versus H & S barrel comparison

	Velocity (fps)	Standard Deviation	Port Pressure (psi)	Standard Deviation	Chamber Pressure (psi)	Standard Deviation
KART BARRELS*	3033	23	13164	108	50923	1181
H-S BARREL	2970	26	12745	122	49918	1230
DIFFERENCES	-63		-419		-1005	

*NOTE: Average of 3 Kart Barrels.

APPENDIX A
REQUEST FOR WAIVER M4S600

DEPARTMENT OF THE ARMY
LAKE CITY ARMY AMMUNITION PLANT
INDEPENDENCE, MISSOURI 64051-0250

REPLY TO
ATTENTION OF

SMCLC-QA (702-4d)

05 JAN 1994

MEMORANDUM FOR Commander, U.S. Army Armament Research, Development and Engineering Center, ATTN: SMCAR-BAT-IR, Rock Island, IL 61299-6000

SUBJECT: Request for Waiver (RFW) W0009-178-93, Cartridge, 5.56mm, SAWS Tracer, M856, Lot LC-93K098-017, Failed Port Pressure

1. The enclosed contractor RFW is forwarded for your disposition.

2. Contractor requests acceptance of cartridge that did not meet port pressure specification requirements. Subject cartridges are not significantly different from previous lots when port pressure was at 12,400 psi. Recommend lot be accepted as is without restriction.

3. No other safety, security, environmental or producibility issues noted.

4. The point of contact is Mr. K. McKee, SMCLC-QA, DSN 463-9162.

ORIGINAL SIGNED BY

Encl

MARY G. GOODWIN
LTC, OD,
Commanding

CF (w/encl):
SMCAR-ESW-S (R)
SMCAR-CCL-SP (Mr. W. Bunting) (D)
AMSMC-PAI-G/TEAM E (wo/encl) (R)
AMSMC-PDM-CA (R)

December 9, 1993

Department of the Army
Lake City Army Ammunition Plant
Independence, Missouri 64051-0250

Attention: Commander/SMCLC-QA

Subject: Request for Waiver (RFW) W0009-178-93, Cartridge, 5.56mm, SAWS Tracer, M856, Lot LC-93K098-017, Failed Port Pressure

Dear Madam:

The subject Request for Waiver (RFW) is being submitted for acceptance of 5.56mm M856 SAWS Tracer lot #LC-93K098-017 (257,657 rounds). The lot, when presented for acceptance testing, failed the test for minimum port pressure. The Lot Failure Analysis Task Force assembled to investigate the root cause of the failure concluded the failure was due to variation in port pressure combined with a revised specification limit. The pressure variation was attributed to several factors including testing method and normal charge weight variation. Task Force findings and test data are attached to support this conclusion and Waiver request. It is important to note that all weapon cyclic rate requirements were met.

Acceptance of this waiver will not result in any adverse safety, security or environmental impacts.

Your review and concurrence is requested.

Very truly yours,

C. A. Hillen
Vice President & General Manager

D. J. Rohan
Director
Quality Assurance

DMP:rjp
Attachments

REQUEST FOR DEVIATION / WAIVER

(See MIL-STD-480 or 481 for instructions)

DATE (YYMMDD): 931209

Form Approved OMB No. 0704-0188

PROCURING ACTIVITY NUMBER: M456000

1. ORIGINATOR NAME AND ADDRESS
Olin Corporation - Winchester Division
Lake City Army Ammunition Plant
Independence, Missouri 64051

2. ☐ DEVIATION ☒ WAIVER

3. ☐ MINOR ☐ MAJOR ☐ CRITICAL

4. DESIGNATION FOR DEVIATION / WAIVER

a. MODEL/TYPE	b. CAGE CODE	c. SYS DESIG.	d. DEV/WAIVER NO.
5.56mm M856			W0009-178-93

5. BASELINE AFFECTED ☐ FUNCTIONAL ☐ ALLOCATED ☐ PRODUCT

6. OTHER SYSTEM / CONFIGURATION ITEMS AFFECTED ☐ YES ☐ NO

7. SPECIFICATIONS AFFECTED - TEST PLAN

	CAGE CODE	SPECIFICATION / DOCUMENT NO.	REV.
a. SYSTEM			
b. ITEM		MIL-C-63990	
c. TEST PLAN			

8. DRAWINGS AFFECTED

	CAGE CODE	NUMBER	REV
		9342865	B

9. TITLE OF DEVIATION / WAIVER
Cartridge, 5.56mm, SAWS Tracer, M856

9.a. WEAPON SYSTEM CODE OR DESIGNATION

10. CONTRACT NO. AND LINE ITEM
DAAA09-91-Z-0009

11. PROCURING CONTRACTING OFFICER
CODE 1CV77 TEL

12. CONFIGURATION ITEM NOMENCLATURE
Cartridge, 5.56mm, SAWS Tracer, M856

13. CLASSIFICATION OF DEFECT

a. CD NO.	b. DEFECT NO.	c. DEFECT CLASSIFICATION
		☐ MINOR ☒ MAJOR ☐ CRITICAL

14. NAME OF LOWEST PART / ASSEMBLY AFFECTED
Cartridge

15. PART NO. OR TYPE DESIGNATION

16. LOT NO.
LC-93K098-017

17. QTY
257,657

18. RECURRING DEVIATION / WAIVER ☐ YES ☒ NO

19. EFFECT ON COST / PRICE
Unknown

20. EFFECT ON DELIVERY SCHEDULE
Unknown

21. EFFECT ON INTEGRATED LOGISTICS SUPPORT, INTERFACE OR SOFTWARE
Unknown

22. DESCRIPTION OF DEVIATION / WAIVER
See Attached

23. NEED FOR DEVIATION / WAIVER
See Attached

24. SERIAL NUMBER(S) AFFECTED

25. SUBMITTING ACTIVITY
D. J. Rohan

25.a. TITLE
Director, Quality Assurance

26. APPROVAL / DISAPPROVAL a. RECOMMEND ☐ APPROVAL ☐ DISAPPROVAL

b. APPROVAL	c. GOVERNMENT ACTIVITY	SIGNATURE	DATE (YYMMDD)
☐ APPROVED ☐ DISAPPROVED			
d. APPROVAL	e. GOVERNMENT ACTIVITY	SIGNATURE	DATE (YYMMDD)
☐ APPROVED ☐ DISAPPROVED			

DD Form 1694, JUL 88 — Previous editions are obsolete. — 297 222

FIGURE 8. Request for Deviation/Waiver (DD Form 1694).

Attachment to Request for Waiver (RFW)
W0009-178-93, Cartridge, 5.56mm,
SAWS Tracer, M856, Lot LC-93K098-017,
Failed Port Pressure

December 9, 1993
Page 1 of 1

22. DESCRIPTION OF WAIVER

The lot failed to meet requirements of Military Specification MIL-C-63990, paragraph 3.8, which states that the mean port pressure minus three standard deviations shall not be less than 12,700 psi for sample cartridges conditioned to 70 degrees plus or minus 2 degrees. This requirement was changed from 12,400 psi to 12,700 psi with Amendment 1 dated 25 September 1991. The lot test results were 12,589 psi on the first test and 12,581 psi on the retest. All other ballistic tests were within specification requirements.

23. NEED FOR WAIVER

Several velocity and port pressure tests have been performed on this lot of ammunition. Five tests were performed during the manufacturing of the ammunition (Attachment 1). All of these tests met the specification requirements.

Three tests, each on a separate gun barrel setup, were initially performed as part of the lot failure analysis (Attachment 2). All of these tests met the specification requirements.

An additional twenty-four tests were performed, three tests for each truck of ammunition using different gun barrel setups (Attachment 3). All of these tests meet the previous port pressure specification of 12,400 psi. Only one test failed to meet the revised port pressure specification limit of 12,700 psi (Attachment 4). This test can be shown to be statistically different from all other tests performed (Attachment 5). A statistical analysis of all the test data combined (240 observations) predicts no cartridges to be out of specification (Attachments 6, 7 and 8).

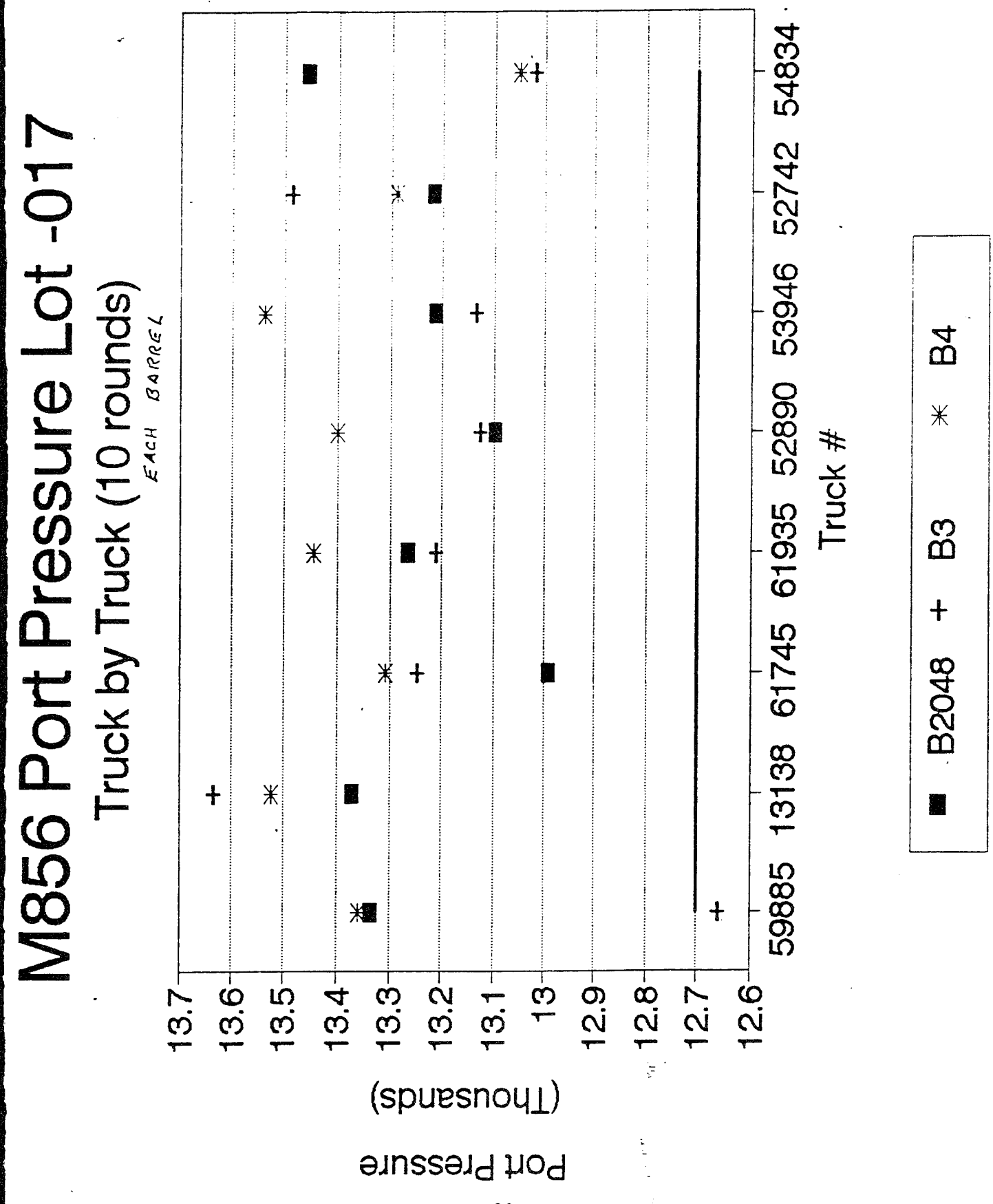
The ammunition has passed all function and casualty testing including weapon cyclic rates.

It was noted during failure analysis that some tests (including the lot acceptance retest) had large standard deviations in port pressure.

The conclusion of the Failure Analysis Task Force was that an increase in the port pressure standard deviation combined with the revised specification limit caused the failed lot acceptance test. The increase in port pressure standard deviation was attributed to random variations in pressure readings caused by the testing system and normal variations in charge weight.

Recommendation

Based on testing performed prior to and after lot acceptance which show the lot to be in conformance, it is recommended this lot be accepted as is.


M856 Port Pressure Lot -017
Truck by Truck (10 rounds)
EACH BARREL
Port Pressure
(Thousands)
13.7
13.6
13.5
13.4
13.3
13.2
13.1
13
12.9
12.8
12.7
12.6
59885
13138
61745
61935
52890
53946
52742
54834
Truck #
B2048
B3
B4
BARREL #

Two-Sample Analysis Results

		PPW3.Port	PPL3.Port	Pooled
Sample Statistics:	Number of Obs.	10	230	240
	Average	13304.1	13596.2	13584
	Variance	46075	27909.5	28596.4
	Std. Deviation	214.651	167.061	169.105
	Median	13278.5	13588	13580

Difference between Means = -292.104

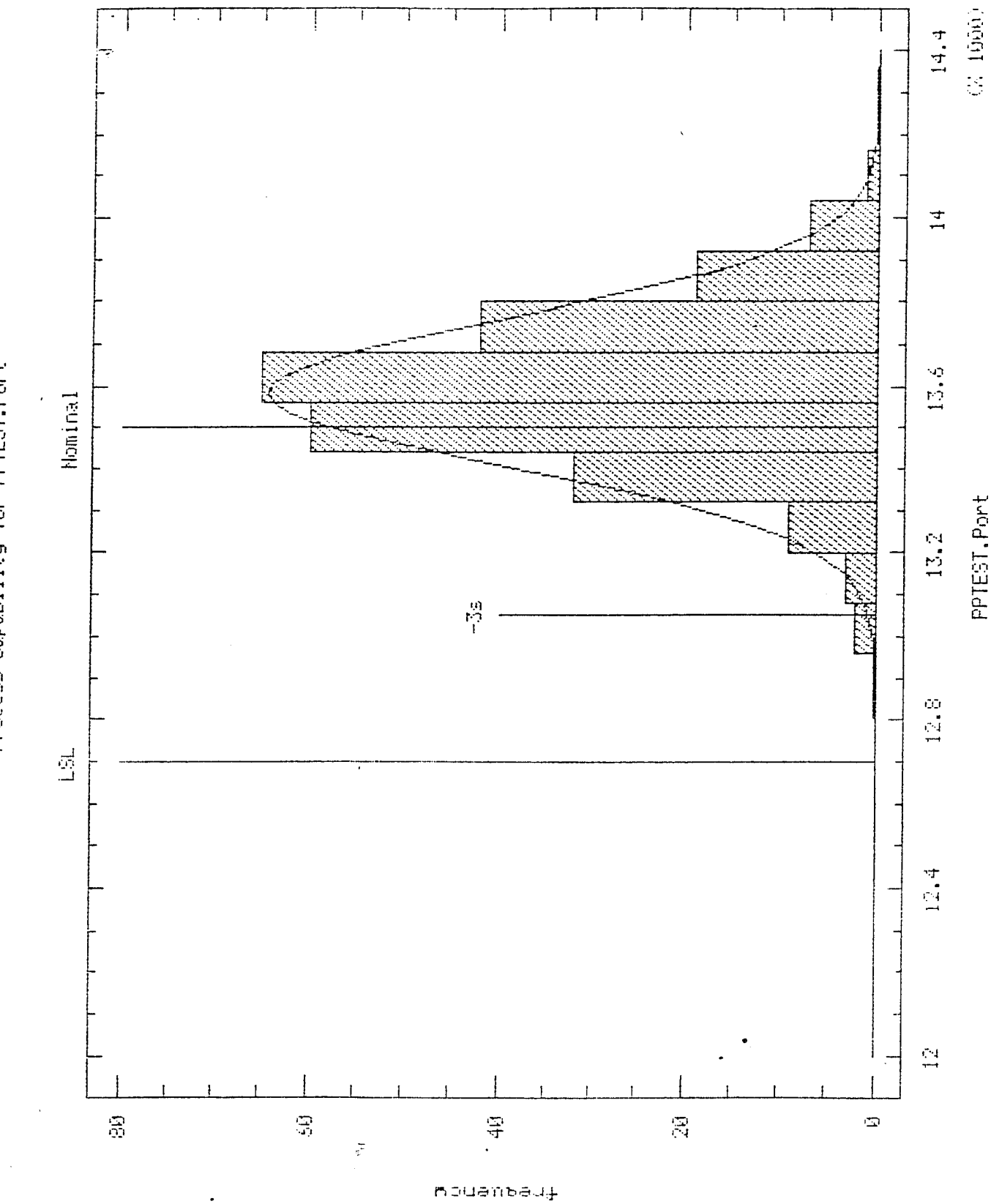
		95 Percent	
Conf. Interval For Diff. in Means:			
(Equal Vars.)	Sample 1 - Sample 2	-399.74 -184.469	238 D.F.
(Unequal Vars.)	Sample 1 - Sample 2	-446.514 -137.694	9.5 D.F.

Ratio of Variances = 1.65087

Conf. Interval for Ratio of Variances: 0 Percent
Sample 1 ÷ Sample 2

Hypothesis Test for HO: Diff = 0 vs Alt: NE at Alpha = 0.05

Computed t statistic = -5.34737
Sig. Level = 2.09132E-7
so reject HO.


Process Capability for PPTEST.Port
LSL
Nominal
-3s
PPTEST.Port
Frequency
12
12.4
12.8
13.2
13.6
14
14.4
0
20
40
60
80

ATTACHMENT 7

Process Capability Analysis

Process Capability for PPTEST.Port

Specification:		Normal distribution:		6.0·sigma limits:	
Upper		Count	240	+3.0 sigma	
Nominal	13500	* Mean	13584	Mean	13584
Lower	12700	* Sigma	178.6	-3.0 sigma	13048.2

Observed beyond spec.:			Estimated beyond spec.:			Capability indices:	
High		%	High		%	CP	
Low	0.000	%	Low	0.000	%	CR	
Total	0.000	%	Total	0.000	%	CPK	1.64993
						(upper)	
						(lower)	1.64993
						K	
						CPM	

* estimated parameter

ATTACHMENT 8

Tail Area Probabilities

Distributions available:

(1) Bernoulli	(7) Beta	(13) Lognormal
(2) Binomial	(8) Chi-square	(14) Normal
(3) Discrete uniform	(9) Erlang	(15) Student's t
(4) Geometric	(10) Exponential	(16) Triangular
(5) Negative binomial	(11) F	(17) Uniform
(6) Poisson	(12) Gamma	(18) Weibull

Distribution number: 14

Mean: 13584

Standard deviation: 178.6

Area at or below 12700 = 3.723745E-7
Area at or below 12400 = 1.694916E-11
Area at or below 13584 = 0.5
Area at or below 13584 = 0.5

APPENDIX B
M856 MINI ROUND ROBIN TEST PLAN

5.56MM, M856 TRACER MINI ROUND ROBIN TEST PLAN

DATE: 5/12/94

PURPOSE: To determine the amount of variation that exists in EPVAT test results utilizing the same test equipment at the following sites:

ARDEC - Picatinny Arsenal, NJ
LCAAP - Independence, MO
Olin - St. Marks, FL

WEAPONS:	QUANTITY:
1-in-7" 5.56mm, EPVAT Barrels	3

AMMO:

LC93K098-017 - 5.56mm, M856 Tracer	180 rds min
LC87F000R011 - 5.56mm, Reference, Heavy Bullet	120 rds max

PROCEDURE:

1. The firing range shall be set-up IAW Section 7, Electronic Pressure, Velocity and Action Time (EPVAT), of the SCATP - 5.56MM (Heavy Bullet) Revision B, 12 Feb 93.

*Note: Velocity screens must be able to accommodate M856 Tracer rds.

2. Five warming (fouling) shots shall be fired prior to the first barrel assessment. After the last warming shot, the port and chamber pressure transducers shall be re-tightened to the appropriate torque level specified in Appendix B of the SCATP.

3. The first EPVAT barrel shall be assessed by firing 20 rounds of 5.56mm, Heavy Bullet Reference ammunition (LC87F000R011). An additional 20 rounds may be used for a retest if the barrel does not qualify on the first test.

4. After the barrel has qualified, 20 test cartridges (LC93K098-017) conditioned at an ambient temperature ($70^{o} \pm 2\ ^{o}F$).

5. The following test data shall be recorded for each round fired:

Chamber Pressure	- nearest 100 psi
Port Pressure	- nearest 10 psi
Velocity	- nearest f/s
Action Time	- nearest .01 ms

The number of cartridges fired may exceed twenty cartridges until a minimum of twenty pressure readings have been recorded.

6. After the ambient test cartridges have been fired, the same barrel shall be used to fire 20 test cartridges conditioned at the hot temperature ($125^{O} \pm 2\ ^{O}F$), followed by 20 test cartridges conditioned at the cold temperature ($-65^{O} \pm 2\ ^{O}F$). The procedure prescribed in Step #4 shall be observed until the required number of pressure readings have been recorded for each test condition.

7. Repeat steps #2 - #5 for each additional EPVAT barrel.

*Note: The above test procedures shall be performed twice at LCAAP, so that each test condition is repeated for each EPVAT barrel.

APPENDIX C
LOT ACCEPTANCE DATA

gb

C 5382

OLIN DEFENSE SYSTEMS GROUP. Lake City Army Ammunition Plant

te Presented
antity Packed
SN
national Lot No.
ntractor Olin Defense Systems Group
ntract No. DAAA09-91-Z-0009
ec. No. MIL-C-63990 ** Rev. B
mend: 1
g. No. 9342865*
v. B
MCMS Code:

BALLISTIC TESTING

ITEM: Ctg., 5.56mm Tracer, M856
Lot No. LC-93K098-017
ACCEPTED ☐ 1st SAMPLE ☐
REJECTED ☒ 2nd SAMPLE ☐
WAVIER ☐ REWORK/REPAIR ☐
Acceptance Date

Primer No. #41 Mix No. FA956
Primer Lot No.: LC-93I704-205
Tracer Mix
Igniter Mix
Propellant OLIN WC-844T
A. L. No. 49644
Chg. (GRS) 26.4
Case: Brass ☒ Steel ☐
Headstamp (Yr) LC 93
Bullet Jacket Gilding Metal
Clad Steel

FIRING TESTS	RDS. FIRED	RECORD	SPEC. LIMIT
VELOCITY @78 Ft. (F/S)			
Corrected Avg (Amb)	20	3003	2990±40
Standard Deviation		25	40 max
(25°) Variation	20	+56	-250
(60°) From	XXXX		from
(65°) 68° to 72°F	20	-45	Avg.
CHAMBER PRESSURE (PSI)	20	49900	MAX 55000
Corrected Avg. (Amb)		54700	61000
Max Reading (Amb)		54200	61000
Mean +3σ (Amb)	20	+1900	+125 Mean
(25°) Variation	XXXX		Max 60000
(60°) From	20	-2400	+7000 Temp.Dif.
(65°) 68° to 72°F			
PORT PRESSURE (PSI)	20	**12590	MIN 12700
Avg. - 3σ (Amb)		13240	-
Corr. Avg. (Amb)	XXXX		
Mean +3σ (Amb)	20	+410	+ 1500
(25°) Variation	XXXX		not less
(60°) From	20	-80	than 11400
(65°) 68° to 72°F			
ACTION TIME (MS)	20	.95	Max.
Amb. Mean +5σ	20	.94	3
(25°) Mean +5σ	XXXX		Milli.
(60°)	20	.98	Sec.
(65°) Mean +5σ			
ACCURACY (INCH) @600 YDS.			Max.
Avg. Tgt. - Vert. Max. σ	90	9.43	10.3
Avg. Tgt. - Horz. Max. σ	90	8.09	10.3
TRACE			
M16A2 Rifle Day	100	100	80
M249 Mach. Gun	100	100	80
M16A2 Rifle Night	100	100	80
M249 Mach. Gun	100	100	80

FUNCTION Mach. Gun	RDS. FIRED @ AMB.	125°	160°	-65°	RECORD	SPEC. LIMIT
M249	400	200		200	OK	
Rifle M16A2	400	200		200	OK	

CASUALTIES None

BULLET INTEGRITY				
M249	100		0	1
M16A2	100		0	

NON FIRING TESTS		NO. TESTED	NO. FAILED	SPEC. LIMIT
WATERPROOF (VAC)	1st Sample	50	0	3
	Cumulative	150		9
BULLET Extraction	1st Sample	25	0	0
	Cumulative	75		2
Base Closure Seal	1st Sample	25	0	3
	Cumulative	75		7
CASE Residual Stress (Mercurous nitrate	1st Sample	50	0	0
	Cumulative	150		1
Hardness Ext. Surface	1st Sample	10	0	0
	Cumulative	30		1
Hardness Hd. Ax. Section		10	0	0

TOTAL AUTHORIZED ROUNDS EXPENDED IN TESTS 2260

Inspected in accordance with contract requirements (except as otherwise authorized and noted hereon).

REMARKS: Bullet Integrity fired simultaneously with Function & Casualty.
ECP: M3Q3000

FOULING - Light Port Pressure out of specification on Amb. first test 12560 second test 12590

Authorized Contractor Representative

BALLISTIC ACCEPTANCE TEST
Small Arms Propellant Powder

Contract: DAAA09-91-C-0494
Tested in accordance with: MIL-P-3984H dated 13 Dec. 1989

OMF91G-049644
CALIBER: 5.56 mm
TYPE: Tracer
DATE: 07/30/91
USER: Lake City

BALL POWDER propellant

Mfr. OLIN CORPORATION

Lot Number WC844T - 817
Made at St. Marks, FL
Net Weight 62,600 lbs.
Charge Weight 26.7 gr.
Air Space +0.02 in.

GUNS

	VELOCITY RIFLE	PRESSURE GAGE
Receiver Number		108
Barrel Number		3
Port Gage		225311
Chamber Gage		456433
Fir. Pin Prot. (in.)		0.032
Fir. Pin Indent. (in.)		0.020
Head Space (in.)		1.498
Times Fired		3428

Bullet Type: M856

Bullet Wt.: 60.5 gr.
Primer: Lake City
Ctg Case: Lake City

BLEND TEST	Rds Fired	Corrected Results	SPECIFICATION LIMITS
VELOCITY @ 78' (ft/sec)			
Average @ +70°F	20	2975	2990 ± 20
Standard Dev.		21	25 ft. Max
Diff. @ +125°F	20	+44	-250' max from 70° Any increase acceptable.
Diff. @ -65°F	20	-76	
CHAMBER PRESSURE (PSI)			
Average @ +70°F	20	51,403	53,000 psi Max
Standard Dev. Xbar + 3σ		1,353 55,462	Xbar + 3σ ≤ 59,000
Max Ave.@+125°F Diff. @ +125°F	20	53,908 +2,505	58,000 Max Average. +6500 Max from 70° Any decrease acceptable.
Max Ave.@ -65°F Diff. @ -65°F	20	47,573 -3,830	
PORT PRESSURE (PSI)			
Xbar-3σ @ +70°F	20	13,398	Xbar - 3σ ≥ 12,400
Diff. @ +125°F	20	-296	±2000 psi from 70°
Diff. @ -65°F	20	-1,283	
ACTION TIME (ms)			
Max Ind.@ +70°F	20	1.10	2.5 ms Max individual at all temperatures.
Max Ind.@+125°F	20	1.07	
Max Ind.@ -65°F	20	1.12	

Uniformity Test	VELOCITY Spec. 2990±10'	Std. Dev. 30 fps max
Ballistic Sample	2983	14
Repre. Sample		
Pack No. 122	2996	18
Pack No. 291	2981	17
Pack No. 366	2979	26
Pack No. 481	2975	13
Pack No. 590	2985	9

Specification Limits: Representative Samples ±25' from Ballistic Sample.

STANDARD REFERENCE CARTRIDGE

Cartridge: LC87F000R011
Test 20 Rounds @ 78 feet.

	Vel.	Chamber	Port
Standardization	2983	47,817	13,414
Recorded	2958	49,955	14,262
Correction	+25	-2,138	-848

OTHER TESTS and REMARKS

Mean Bullet Pull = 81 lb
Max Bullet Pull = 100 lb
Min Bullet Pull = 63 lb
(Spec = 45 lb minimum individual)

100% trace

This BALL POWDER propellant LOT meets the ballistic test requirements:

QUALITY ASSURANCE REPRESENTATIVE

GOVERNMENT REPRESENTATIVE

Form SM-QA-[illegible]

PROPELLANT DESCRIPTION SHEET

OMF91G-049644 Date: 07/30/91

ɔt: WC844T - 817 User: Lake City

Manufactured at Olin Corporation, St. Marks, FL Packed Amount 62,600 lbs

Contract No. DAAA09-91-C-0494
P.O. Number:

Specification: Propellant is compliant with drawing 9378273, Rev. C dated 1 June 1989

TESTS OF FINISHED PROPELLANT

	Spec.	Result	TEST	Spec.	Result
Nitrocellulose	Remainder	82.79	Nitrogen	13.00-13.20%	13.08
Total Volatiles	2.00% Max	1.12	Hygroscopicity	1.75% Max	NA
Dinitrotoluene	1.0% Max	0.1	Tin Dioxide	0.1% Max	0.0
Moisture/Volatiles	0.75-1.25%	0.97			
Dibutylphthalate	3.50-6.00%	4.11			
Sodium Sulfate	0.50% Max	0.05	Granulation		
lcium Carbonate	0.25% Max	0.04	US Sieve		
itroglycerine	9.00-11.20%	10.64	20	97% Min Thru	100.0
Diphenylamine	0.75-1.50%	1.02	25	On	3.9
Residual Solvent	1.20% Max	0.32	30	On	52.4
Heat 120°C SP	60' Minimum	100	35	On	30.7
Heat 120°C EXP	5 Hrs Min	5+	40	On	12.7
Dust & Foreign	0.10% Max	0.02	25 TO 40	90% Min On	99.7
Graphite	0.4% Max	0.2	40	7.0% Max Thru	0.3
Bulk Density(gm/cc)	0.945-1.025	0.994	45	3.0% Max Thru	0.1
Potassium Nitrate	0.1% Max	0.0			

emarks:

PACKED: 07/29/91

SAMPLED: 07/29/91

TESTS FINISHED: 07/30/91

OFFERED: 07/30/91

proval:

QA Manager

Government Representative

Form: SM-QA-027

APPENDIX D
5.56-mm REFERENCE LOT PORT PRESSURE ADJUSTMENT

AMSMC-QAF-S (D)

SEP 2 6 1991

MEMORANDUM for AMSMC-QAM-P, ATTN: Cathy Doyle

SUBJECT: 5.56mm, M855 Reference Lot LC87F000R011 Assessed Values - Port Pressure Adjustment

Based on the past two (2) years use of 007 and 011 reference lots, there is clearly a 700 psi average difference between port pressure correction factors of the two lots. Since lot 011 has been averaging -800 psi correction factors since its assessment, it would be appropriate to adjust it's assess value from 13,414 psi to 14,114 psi (700 psi higher). This will bring the two reference lots in line with each other. All activities using the 011 reference lot should be informed of this change.

ROBERT E. LEE
Chief, Sm Cal Armt Sys Branch
FC&SC Armt Sys Division

CF:
SMCLC-CA
SMCAR-CCL-S,
F. Puzycki

APPENDIX E
TRANSDUCER TORQUE VALUE CHANGE

KISTLER Piezo Instrumentation

KISTLER INSTRUMENT CORPORATION ■ 75 John Glenn Drive, Amherst, N.Y. 14120

Phone: 716-691-5100 ■ TWX: 710-262-1284 ■ Telegr: Kistler AHST

April 16, 1985

Mr. Pat Taranto
US Army
AMSMC-QAF-1-(D)
Dover, NJ 07801

Dear Pat:

I am writing to confirm the following changes that have been recommended by KIAG (Kistler Instrumente AG, Switzerland) in the use of the 6203 and 6555.

The recommended mounting torque has been reduced to 10-12 Nm. The 12 Nm torque level should be considered a maximum allowable torque and should not be exceeded.

The type 6555 damping seal should be inspected after 100 rounds and replaced after 200 rounds.

If you have any questions on these changes, please do not hesitate to contact me.

Sincerely,

KISTLER INSTRUMENT CORPORATION

Paul F. Bussman
Sales Engineer

/wsm

DEPARTMENT OF THE ARMY Ms. Adams/bam/AUTOVON
HEADQUARTERS US ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND 793-3764
ROCK ISLAND ILLINOIS 61299

30 APR 1985

REPLY TO
ATTENTION OF:

AMSMC-PCG-S (R)

SUBJECT: Supplemental EPVAT Acceptance Testing

Contracting Officer's Representative
Lake City Army Ammunition Plant
ATTN: SMCLC-EN
Independence, MO 64051-0330

1. Reference message 221500Z Apr 85 AMSMC-QAF-S (D) SAB (encl 1).

2. Request the operating contracting be advised of the subject testing requirement and take appropriate action to accomplish the requested testing.

3. The costs to perform the subject testing should be charged to the benefiting end item.

4. If sufficient funds are not available take no action and formally notify AMSMC-PCG-S by CLIN the additional funding required.

1 Encl
as

MARY B. ADAMS
Procuring Contracting Officer

EN XC
CO
XO
SA

LAKE CITY A.A.

APR 24 11 05 AM '85

#2996

[illegible]ZYUW RUBOSKA[illegible] [illegible]-UUUU--RUHTN[illegible]
UUUUU
[illegible]Z APR 85
[illegible] DOVER NJ //AMSMC-QA[illegible]//
[illegible] INDEPENDENCE MO //[illegible] W MELTON//
[illegible] REMINGTON ARMS CO LCAAP INDEPENDENCE MO //R BENTLEY/
[illegible]//

[illegible]AS
[illegible] SUPPLEMENTAL EPVAT ACCEPTANCE TESTING
[illegible] IN ADDITION TO THE EPVAT TEST REQUIREMENTS SPECIFIED FOR THE
[illegible] BALL [illegible] AND [illegible] CARTRIDGE [illegible] UNTIL
[illegible] NOTICE THE FOLLOWING SPECIFIED TEST SHALL ALSO BE PERFORMED.
[illegible] BALL AND TRACER [illegible] SUBMITTED FOR ACCEPTANCE AN ADDI-
[illegible] ROUNDS (20 AT EACH SPECIFIED TEMPERATURE) SHALL BE SUBJECT
[illegible] EPVAT TEST USING EPVAT BARREL [illegible] MODIFIED FOR THE
[illegible] TRANSDUCER AND [illegible] MECHANICAL [illegible] MODIFICATION
[illegible] BE SUPPLIED AT A LATER DATE. TEST RESULTS OF THE [illegible]
[illegible] THE [illegible] TRANSDUCER SHALL BE FURNISHED AS PART OF THE
[illegible] ACCEPTANCE TEST REPORT.
[illegible] CURRENT [illegible] ACCEPTANCE TESTING THE PIEZOELECTRIC KISTLER
[illegible] TRANSDUCER TORQUE REQUIREMENT WILL BE REDUCED FROM [illegible] INCH-
[illegible]NDS TO [illegible] INCH-POUNDS. MECHANICAL [illegible] MODEL [illegible] MUST BE

[illegible] RUBOSKA[illegible] UNCLAS
[illegible]ECTED APPROXIMATELY EVERY [illegible] ROUNDS AND REPLACED [illegible] MOUTH
[illegible]TION ONLY AFTER APPROXIMATELY 200 ROUNDS.
[illegible] FOR BARREL MODIFICATION IS [illegible] SMITH/[illegible] TABANTE, AMSMC-QA[illegible]
[illegible] AUTOVON [illegible] OR [illegible]

[illegible]

NN

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