

EVALUATION OF NORMA 5.56 AMMUNITION

COLT'S INC

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EVALUATION OF NORMA 5.56 AMMUNITION

10,000 rounds were available for testing for functioning in the AR-15 as well as for comparison with the regular Remington M193 Ball ammunition containing WC846 propellant, currently used for routine testing.

EXTERNAL DIMENSIONS:

The averages of measurements of a random sample of 10 rounds were obtained and found to compare as follows:

	Norma	Remington	Normal Maximum
Rim diameter	0.374"	0.375"	0.378"
Head diameter	0.374	0.373	0.376
Shoulder diameter	0.352	0.349	0.354
Neck diameter (loaded)	0.251	0.248	0.253
Case length	1.754	1.754	1.760
Overall cartridge length	2.246	2.254	2.260

The Norma cartridges use a sealant, made visible with a green dye, at the mouth of the case in the bullet cannelure and also around the primer rim. The cases are headstamped "NORMA .223".

HEAD TO SHOULDER LENGTHS:

This is the dimension from the head of the case to a datum line midway of the shoulder, this line being 0.330-in. for a maximum cartridge. A barrel section including the chamber of a barrel was placed vertically on a surface plate under a dial indicator. The chamber was selected as being correct in dimensions. Using a master headspace gage, the dial indicator was zeroed at 1.4666-in. to correspond to a maximum cartridge. Data were taken on a 100-round random sample of both Norma and Remington cartridges measured with the dial indicator and cartridges in the chamber, as follows:

Head to Shoulder, Zero at 1.4666" from 0.330" Datum	Number found in each interval	
	Norma	Remington
+0.001 "to +0.002"	6	0
+0.000 to +0.001	8	0
-0.000 to -0.001	49	1
-0.001 to -0.002	37	32
-0.002 to -0.003	0	67
Total number:	100	100

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A histogram of these data is appended.

BULLETS:

A random sample of 10 bullets averaged 0.737" in length and 55.27 grains in weight. They are flat base with tangent ogival heads estimated to have been struck to a 6.5 diameters radius. The jackets are non-magnetic and have the appearance of gilding metal.

POWDER:

The average of 10 weighings of powder charges from the random sample was 26.24 grains. This powder is of the chopped tube variety with a shiny glaze, as from graphite, and is quite similar in appearance and size to the commercial powders sold by Norma like 201 and 203. The charge was noted to be very slightly compressed in the cases.

PRIMERS:

The primers are crimped in the cases and are of Boxer (American) type bearing a trademark type of stamp, reading N P. They are not nicked. Five specimens of the Norma and Remington cases were subjected to a Primer Sensitivity Test at each increment of height throughout the range of mixed results according to the procedure contained in AMSMU-P 715-501FA1 of 23 Oct., 1964, with the following results:

	<u>Mean Critical Height with 4 oz. Ball</u>	<u>Equivalent Energy, Inch-Ounces</u>	<u>Standard Deviation Inch-Ounces</u>	<u>Range of Sensitivity, Inch-Ounces</u>
Norma	4.50	18.00	3.58	7.3 to 28.7
Remington	6.50	26.00	6.20	7.4 to 44.6

The desirable range of sensitivity is from 12 to 48 inch-ounces, bringing the Mean Critical Energy to about 30 inch-ounces; this is where 50% of the primers can be expected to fire and/or 50% are expected to mis-fire.

PRESSURE AND VELOCITY:

The Universal Receiver was used for firing Reference Ammunition with short piston for muzzle velocity and port and chamber pressures. The values were compared with the Assessment for this lot (RA 5050) to produce corrections in these values to be applied to a 20-round Norma random sample and a 10-round Remington sample for comparison:

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	<u>Short Piston Velocity at 15 feet, f/s.</u>	<u>Chamber Pressure, psi (Copper)</u>	<u>Port Pressure, psi (Copper)</u>
Norma (20)	3219	57395	15120
Standard Deviation	44	2355	391
Remington (10)	3206	51960	15380
Standard Deviation	18	1716	330

VELOCITY ASSESSMENT:

A 20 round sample was fired in the Universal Receiver with long piston for velocity in comparison with the Remington ammunition. Correction was made from a long piston firing with the Reference Lot of ammunition so the following figures result:

	<u>Corrected 15' Instrumental Velocities, f/s</u>
Norma (20)	3288
Remington Control (20)	3268
Reference Lot	3244

ACCURACY FROM FIXED REST:

Using the long piston in the Universal Receiver, five groups of ten random rounds each were fired for accuracy at 50 yards with the following comparative results:

	<u>Diagonal, inches</u>
Norma	1.04
Remington	1.32

CYCLIC RATE OF FIRE:

One 20-round burst in each of 10 new AR-15s was used for determination of cyclic rate (rounds per minute). 10 bursts were fired with both the Norma and Remington ammunition in these guns which contained alternately the standard buffer and the GX buffer. Following are the average figures for the 10-burst firings:

	<u>Norma Ammunition</u>		<u>Remington Ammunition</u>	
	<u>Standard Buffer</u>	<u>G - X Buffer</u>	<u>Standard Buffer</u>	<u>G - X Buffer</u>
Average Cyclic Rate	786	718	910	781
Standard Deviation 10 bursts	46	33	31	26

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VELOCITY IN THE AR-15 RIFLES:

Ten new AR-15 rifles were taken at random from recent production and fired for 15' instrumental velocities with both the Norma and Remington ammunition. The velocities below are averages of ten shots from each rifle with each powder:

AR-15 Rifle Number	15' Instrumental Velocities, f/s	
	Norma	Remington
233442	3223	3158
238844	3208	3146
238792	3212	3157
234083	3194	3135
237232	3218	3119
234050	3224	3136
237188	3205	3137
238428	3224	3133
237559	3226	3131
233634	3210	3155
Grand Average	3214	3139
Standard Deviation	10	12

PRELIMINARY FUNCTIONING TEST:

Two 1000 round series were fired, 1000 rounds in each of two guns, from 20-round clips, fully automatic fire. The schedule was for five 20-round bursts consecutively, then followed by compressed air cooling of the barrels for approximately five minutes before the next group of five 20-round bursts. The serial numbers of the two guns were 015492 and 015323. Only one malfunction ascribable to the Norma ammunition was observed in the latter gun. Round No. 761 had a ruptured primer because the case contained no flash hole. No other case casualties were observed after inspection.

FOULING TESTS:

A new gun (serial number 015492) was subjected to automatic fire as in the schedule above with 3000 rounds of Norma ammunition in a new barrel "A" and again to 2000 rounds of Remington ammunition in another new barrel "B". The average 15' instrumental velocity for 10 shots each of Norma and Remington ammunitions was obtained for barrels A and B before firing, then for both barrels after the first 1000 rounds, again after 2000 rounds and barrel A after 3000 rounds. Velocity results follow:

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	<u>Barrel A fired with Norma Ammunition</u>		<u>Barrel B fired with Remington Ammunition</u>	
	<u>15' Velocity, S.D.</u>		<u>15' Velocity, S.D.</u>	
	f/s		f/s	
Zero Rounds, Norma Ammunition (10)	3195	32	3165	50
Zero Rounds, Remington Ammunition (10)	3129	27	3159	28
After 1010 Rounds, Norma Amm. (10)	3216	53	3185	24
After 1010 Rounds, Remington Amm. (10)	3157	23	3179	28
	A		B	
After 2020 Rounds, Norma Amm. (10)	3212	34	3137	32
After 2020 Rounds, Remington Amm. (10)	3154	30	3180	30
After 3030 Rounds, Norma Amm. (10)	3190	29	-	-
After 3030 Rounds, Remington Amm. (10)	3157	24	-	-

The gun was not cleaned at any time during the tests and no malfunctions ascribable to either ammunition or fouling were noted. Fouling was noted with both types of ammunition throughout the gas system and was judged heavy for both in spite of the absence of malfunctions.

The preceding velocity data indicate no velocity loss observable after 3000 rounds of firing with the Norma ammunition nor with the Remington ammunition after 2000 rounds. Erosion, had it been produced to any marked degree, would be characterized by a decrease in velocity.

OBSERVATIONS:

The chamber pressure produced by the Norma loading was significantly higher than U. S. Military Specifications allow, and might be expected to result in cartridge-case casualties under certain adverse conditions of service use.

The primers of the Norma ammunition were typically too sensitive, thus increasing the risk of accidental firing in the AR-15 rifle, or similar weapons, upon closure of the bolt.

The bullet configuration of the NORMA sample, being flat-base, would cause some mismatch of trajectories, by comparison to 5.56 mm U. S. Military ammunition, especially at long ranges.

The absence of a flash-hole (vent) in one cartridge of the sample is an isolated defect, not related to design. However, such defects obviously must be guarded against, by quality-assurance measures implemented during production.

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HEAD TO SHOULDER MEASUREMENTS
SAMPLE SIZE = 100

