

PROGRESS REPORT
M/721 - .30-06 Testing
M/722 - .220 Swift Testing

Period: January 23, 1946, to March 13, 1946
Project: FTD-151-2 W.O. 70243 - M/721
 W.O. 70244 - M/722
Amount Authorized: W.O. 70243 - \$400.00 Spent \$519.44
 W.O. 70244 - \$400.00 Spent: \$59.42
Previous Progress Reports: None
Notebook #334
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Introduction

This is the third report on testing the various calibers of the M/721 and 722, earlier ones having dealt with the .300 Savage and .300 H and H Magnum (September 24, 1945), and the .270 Winchester and .257 Remington Roberts (February 15, 1946). Extractor and Sear difficulties encountered in the first testing had been overcome, so testing has been aimed at checking firing performance of the model and thus has been less extensive.

The guns were assembled from the parts list in effect September 24, 1945.

Objective

The testing was designed to investigate the accuracy and performance of the models in the .30-06 and .220 Swift calibers.

Work Program

The testing schedule involved thirty-one steps of tests for each gun, including 6260 functional cycles: 1260 live fire and 5000 dry fire with dummies; and quantitative tests such as trigger pull, firing pin indentation, and bolt lift. The guns were cleaned at intervals of 500 rounds.

It should be noted that, except for the barrel, the guns had the same parts that were in the M/721-.270 Winchester and M/722-.257 Roberts, so this report alone reflects approximately only one-half the total testing on the guns, exclusive of the barrels. For reasons given below, the M/722-.220 Swift was withdrawn from testing, but the schedule was finished on the M/721-.30-06.

Remington ammunition fired in the .30-06 covered what was available at the time. These types of cartridges are denoted by an asterisk (*) in the following list of Remington and Peters ammunition:

Remington

Express Mushroom	Core-Lokt	220 gr.
*Express Soft Point	Core-Lokt	220 gr.
H1-Speed Mushroom	Core-Lokt	180 gr.
*H1-Speed Soft Point	Core-Lokt	180 gr.
Pointed Taper Heel	Metal Case	150 gr.
*H1-Speed Bronze Point	Expanding	150 gr.
*H1-Speed Bronze Point	Expanding	180 gr.
H1-Speed	Mushroom	110 gr.
Palma Match Taper Heel	Metal Case	180 gr.

Peters

Boattail	Metal Case	172 gr.
High Velocity Hollow Point	Inner Belted	220 gr.
High Velocity Soft Point	Inner Belted	220 gr.
Protected Point	Expanding	150 gr.
High Velocity P. Pt.	Expanding	180 gr.
High Velocity Hollow Pt.	Inner Belted	180 gr.
High Velocity Soft Pt.	Inner Belted	180 gr.
Pointed Taper Heel	Metal Case	180 gr.

Conclusions

1. Testing results lead us to believe no new information would be gained in testing further the M/721-.30-06.
2. Malfunctions arising in feeding from the magazine were the basis for cancelling the .220 Swift from the M/722 series.
3. First shell from the magazine stemming the chamber was the only malfunction observed in 1260 rounds of live fire. This malfunction occurred 21 times in firing 200 rounds of Remington ammunition Lot K10N8, but with no other lot or make of ammunition used in the test.
4. No gun failure occurred with the .30-06 cal.
5. The accuracy of the .30-06 caliber was 62% of Mann Barrel accuracy.
6. Malfunctions observed with dry fire with dummies were mainly feeding malfunctions (70 out of 75).
7. Variation in trigger pull from test to test is more likely due to disassembly of the gun twice than to change due to the testing program.
8. Competitive ammunition tests were made with Western and Winchester cartridges. No malfunctions were observed in 400 rounds.

Future Program

No other calibers for these models are contemplated, so testing in the future will be on pilot line guns in each caliber: .300 H & H Magnum. .300 Savage, .257 Roberts, .270 Winchester, and .30-06.

Patent Situation

This was not involved in the testing program.

Experimental Details

In view of the fact that testing was stopped early on the .220 Swift, it will be covered first in this section. More details than are given here may be obtained from Notebook 334, available on request.

M/722 - .220 Swift

1. Percent Malfunctions:

Ten failures to feed from the magazine were observed in 50 rounds of live fire, for 20% malfunctions.

2. Proof Test:

The gun gave satisfactory performance on this test.

3. Dry Firing With Dummies:

Thirty seven failures to feed in 180 trials were observed, so testing was stopped at this point, and it was not resumed.

4. Bolt Lift Test:

The only live firing done with the gun was with 50 rounds in this test. More important than the bolt lift determined in this test (6 lb.) were the 10 failures to feed from the magazine in the 50 rounds fired.

5. Accuracy Test:

One accuracy test was completed on this gun. The results were:

	<u>E.S.</u>	<u>E.H.S.</u>	<u>E.V.S.</u>	<u>M.R.</u>
Ave. of 5 10-round groups:	2.51"	1.65"	2.20"	.72"

6. Jar Off Test:

In this test the gun with safety off is dropped 10" onto a solid wood surface from each of four different positions. The gun did not fire from any position.

7. Safety Mechanism Shock Test:

The safety mechanism performed perfectly in this one trial.

8. Take Down Inspection:

The front and rear pins on the trigger assembly were found to be loose when this was checked after the proof test.

9. Chamber Dimension Test:

Chamber dimension was measured early in the testing but no comparison was available as testing was stopped before the measurement was to be made again. Results of the measurement were:

<u>Neck</u>	<u>Shoulder</u>	<u>1" Rear of Shoulder</u>	<u>.060" from flange</u>
.261"	.404"	.4325"	.4455"

10. Head Space Test:

Only a minimum head space gage was available. This min. gage fit with a slight amount of "feel".

11. Trigger Pull Test:

The average of five trials was 3# 10 oz.; expected range: 3# 8 oz. to 3# 12 oz.

12. Firing Pin Indentation:

This could not be performed for lack of a crusher cylinder holder.

M/721 - .30-06 Testing

1. Percent Malfunctions:

In 1260 rounds of live fire, the following malfunctions were observed:

First shell out of magazine stems chamber	21	1.67%
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These 21 malfunctions were observed in firing 200 180 gr. Soft-Point Remington cartridges, Lot K10N8. No malfunctions were observed with ammunition from other lots.

2. Gun Performance:

No gun failures were observed, but a gun performance figure for 10,000 rounds is not given on the basis of 1260 rounds because of its impracticability.

3. Proof Test:

The gun withstood the pressure of the 5 proof loads.

4. Live Firing Tests:

The only malfunction encountered in 1260 rounds of live fire with Remington, Western and Winchester ammunition were 21 instances of the first shell out of the magazine stemming the chamber, the ammunition being Remington 180 gr. Soft Point, Lot K10N8.

<u>Mfr.</u>	<u>Type</u>	<u>Lot</u>	<u>Rds.</u>	<u>No. of Malf.</u>	<u>Kind of Malfunction</u>
Remington	180 gr. soft pt.	K10N8	200	21	1st Shell out of mag. stems chamber.
Remington	180 gr. Bronze pt.	C22P17	400	0	
Remington	150 gr. Bronze pt.		200	0	
Remington	220 gr. S.P.C.L. Express		60	0	
Western	180 gr. Boat tail Op. Pt.- Express Super-X Lubaloy	ABWL71	200	0	
Winchester	180 gr. Super Speed Pt. Express	12510	200	0	
			<u>1,260</u>	<u>21</u>	

5. Dry Firing With Dummies:

Malfunctions observed in dry firing were not included in those upon which percent malfunctions was based. They were as follows:

	<u>Step 11</u>	<u>Step 13</u>	<u>Step 22</u>	<u>Step 24</u>	<u>Total</u>
Fail to eject	2				2
1st shell stems chamber	27	11			38
Nose of shell hits front of magazine	5	16			21
Fail to feed from magazine			4		4
Stems front of magazine	34	27	4	$\frac{11}{11}$	$\frac{11}{76}$ in
				5,000:	1.5%

6. Bolt Lift Test

Bolt lift was changed from previous testing with five rounds each of dummy and live ammunition to 50 rounds of live ammunition only. The mean and expected range of measurements were as follows: mean bolt lift = 7 lbs. expected range: 5# 10 oz. to 8# 10 oz.

7. Accuracy Tests:

	<u>E.S.</u>	<u>E.H.S.</u>	<u>E.V.S.</u>	<u>M.R.</u>	<u>% Mann Barrel</u>
First Test	2.51"	2.11"	2.12"	.78"	
Second Test	2.27"	2.12"	2.17"	.72"	
Third Test	2.06"	1.81"	1.42"	.66"	
Avg.	2.28"	1.92"	1.90"	.73"	62%
Mann Barrel	1.55"	1.06"	1.38"	.45"	

8. Jar Off Test:

In this test, the gun, with safety "off", is dropped 10" onto a solid wood surface from each of four different positions. In no case did the firing pin fall.

9. Safety Mechanism Shock Test:

The gun performed satisfactorily in this test, similar in scope to the "Jar Off Test" but having the safety "on" in each trial. The safety remained "on" throughout the test.

10. Chamber Dimensions:

Chamber casts were made at steps 2, 18 and 28.
Measurements were as follows:

	<u>Neck</u>	<u>Shoulder</u>	<u>1" rear of shoulder</u>	<u>.060" in front of flange</u>
Step 2	.3405"	.444"	.458"	.471"
Step 18	.3405"	.443"	.458"	.470"
Step 28	.341"	.4435"	.458"	.470"

11. Head Space Test:

Only two gages were available: maximum and minimum.
The bolt would close on the min. gage, not on the max. gage.

12. Firing Pin Indentation:

The average of five trials was .019" indentation.

13. Trigger Pull Test:

Trigger pull was checked at Steps 5, 18 and 30.
The decrease of 15 oz. in averages may be attributed to
disassembly of the gun after Step 14 by Process Group
in the Engineering Section, and after Step 28, to remove
Cerrosafe from the trigger action.

Step 5: Ave. 4 $\frac{1}{2}$ 13 oz.; expected range: 4 $\frac{1}{2}$ 11 oz.
to 4 $\frac{1}{2}$ 15 oz.

Step 18: Ave. 3 $\frac{1}{2}$ 14 oz.; expected range: 3 $\frac{1}{2}$ 13 oz.
to 3 $\frac{1}{2}$ 15 oz.

Step 30: Ave. 5 $\frac{1}{2}$ 5 oz.; expected range: 4 $\frac{1}{2}$ 15 oz.
to 5 $\frac{1}{2}$ 11 oz.

14. Take Down Inspection Test:

Step 2

Assembly was apparently satisfactory.
The front guard screw was tightened to 2 marks
on the scale of the torque screw driver; the rear
guard screw was similarly tightened to 1 $\frac{1}{2}$ marks.

Step 31

Bedding of the stock was questionable.
Tightness of front and rear guard screws could not
be evaluated because of disassemblies of gun at
various times.

.30-06, .220 Swift Testing Schedules

1. Proof Test #1
2. Take Down Inspection Test #11
3. Chamber Dimension Test #2
4. Head Space Test #3
5. Trigger Pull Test #6
6. Firing Pin Indentation Test #8
7. Jar Off Test #27
8. Safety Mechanism Shock Test #9
9. Accuracy Test #4
 - a. M/721 - .30-06 - 180 gr. Soft Point Standard
 - b. M/722 - .220 Swift - 48 gr.
10. Revised Bolt Lift Test #10
11. Dry Firing Test with Dummies #13
12. Live Firing Test #12
13. Dry Firing Test with Dummies #13
14. Live Firing Test #12
15. Accuracy Test #4
16. Chamber Dimension Test #2
17. Head Space Test #3
18. Trigger Pull Test #6
19. Clean Gun: wire brush, powder solvent, wipe out barrel.
20. Dry Firing Test with Dummies #13
21. Live Fire Test #12
22. Dry Fire Test with Dummies #13
23. Live Firing Test #12
24. Dry Firing Test with Dummies #13
25. Clean Gun - as in Step 19
26. Outdoors Live Firing Test #24 (Indoors: upwards with dummies,
downwards with live rounds)
27. Accuracy Test #4
28. Chamber Dimension Test #2
29. Head Space Test #3
30. Trigger Pull Test #6
31. Take Down Inspection Test #11