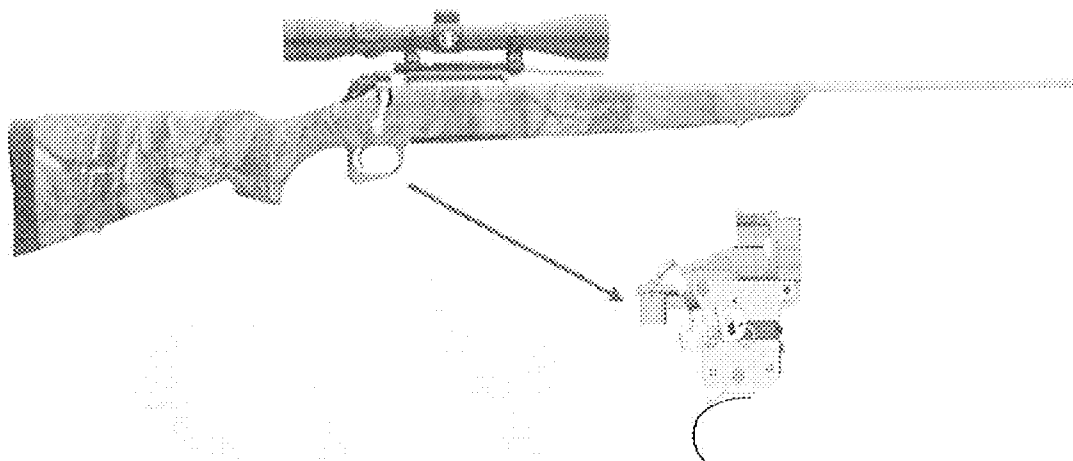


# Remington.



## TRIAL & PILOT TEST FINAL REPORT



### *Model 770 w/Trigger Block Fire Control*

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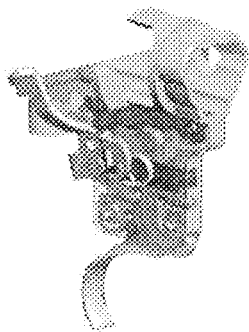
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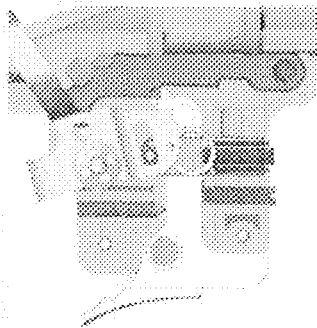
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## INTRODUCTION

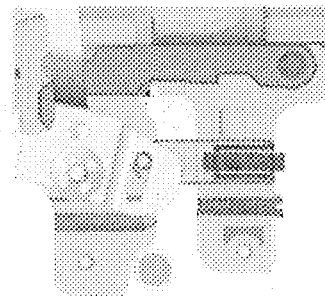
The Model 770 Bolt Action Centerfire rifle variants utilize the same basic action system that was originally introduced as the Model 710 in 2001. Since that time the receiver insert was redesigned on the Model 710 to reduce the amount of synthetic material used to guide the bolt in the receiver to improve action feel and Magnum calibers and stainless actions were also added. A stock redesign effort to update the cosmetics and ergonomics resulted in a Model change to the Model 770. The fire control has remained unchanged since introduction of the 710 outside of the insert used to secure the fire control to the receiver. Since then the Model 700 line has been updated with the X-Mark Pro and X-Mark Pro Adjustable fire controls. A design project was initiated to investigate updating the M710 fire control in late 2006 to early 2007. This effort culminated into the fire control design that is the subject of this report. The design incorporates a Trigger Block Safety feature in addition to the existing Sear Lift action in the existing design. The Trigger is also returned to the unfired position when the Safety is cycled from the "Off" to the "On" position. A DAT was successfully run on the initial design in late 2007. This design proved to be not manufacturable as originally designed. Elizabethtown's design group in collaboration with Mayfield's engineering resources focused efforts to refine the design and the manufacturing processes to manufacture parts. Improvements resulted in the same basic fire control design with improvements to make the design more manufacturing friendly. Since the design is essentially the same and production processes were in place to fabricate parts the project moved into a formal Trial & Pilot phase. 20 Sample guns were built with this new fire control design and were delivered to Elizabethtown's test lab in April to conduct formal T&P Test protocol. The scope and results of this testing are the focus of this report.



*Figure 1: Iso View w/Transparent  
 Rt. Side Plate*



*Figure 2: View w/ Safety "On"*



*Figure 3: View w/ with Safety "Off"*

## TESTING SCOPE

The scope of this Trial & Pilot test protocol was extensive, with the primary focus on tests specific to the operation of the fire control. 20 Sample guns total, broken up into three different configurations (ten blued .30-06 Springfield samples - Order # 85633, five 7mm Rem. Mag. stainless/camoed samples - Order # 85657, and five .243 Win. Youth samples - Order # 85637) were tested. Checks, measurements and tests focused on the proper operation of the fire control as well as the entire firearm. These included fire control specific measurements checked at the start and through-out the test, functional testing and endurance, and then environmental and abuse tests. A detailed test matrix showing the tests each individual rifle was subjected to was generated and followed. This detailed matrix along with both summary and detailed results is referenced later in this report. Performance of non-Fire Control related areas such as accuracy; feeding and ejection were monitored and recorded, although these areas were not used as hard judgment criteria for the T&P of the new fire control.

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## RESULTS SUMMARY

Results of the T&P test show that all required T&P testing was passed satisfactorily. The following Table summarizes the measurements, checks and tests that were included in this evaluation along with a final test outcome. A more detailed explanation of the areas rated as yellow in this summary table follow in follow sections of this report. In addition a detailed spreadsheet titled "TLW2904 - 770 Fire Control T&P.xlsx" is available upon request which contains all the detailed data and test results by firearm for each phase of the evaluation. This spreadsheet contains numerous hyperlinks in the Test Matrix worksheet which will take you directly to the test details you're interested in reviewing.

? TEST CATEGORY ?		RECEIVER # ?	? PROGRESS & RESULT LEGEND ?	
Assembly & Part Conformance	SERIAL # ?	MODEL ?	○ = Planned	<div></div> = Not Planned
Operating Metrics & Bench Function Confirmation				
Headspace Evaluation	CALIBER ?		⊗ = Completed with Issues	⊗ = Completed @ Martins, Passed
Live-Fire Function & Endurance				
Dynamic Measurements			⊗ = Completed, Passed	
Environmental				
Absence			⊗ = Completed, Failed	
			⊗ = Cancelled	
			○ = Cancelled, Rescheduled to Different Gun	
DESCRIPTION ?		M770 with Trigger Block FC		
? TEST DESCRIPTION ?			? COMMENTS / RESULTS ?	
Trigger Pull Force (Dvorak)			⊗ All guns above the SAAMI 3 lb. minimum, 4 guns just over 6 lb. max	
Safety Function Check			⊗ All Checks Passed	
Engagement			⊗ Just above the high end of the specification range.	
Trigger Movement w/ Safety ON			⊗ 1 gun as received was .015" - communicated to Mayfield (set incorrectly)	
Trigger Overtravel			⊗ For information Only	
Safety Forces			⊗ All measurements above the SAAMI 1 lb. minimum threshold ("On" to "Off")	
Overall Gun Weight			⊗ For information Only	
Measure Headspace			⊗ All within new gun limits	
Proof Test			⊗ All guns subjected to 1 proof round, one .243 had to be reproofed.	
Re-Measure Headspace			⊗ All within limits and no significant growth from Proof	
Jack Function Test (100 rds.)			⊗ All guns functioned acceptably except 2 which had magazine box issues	
Shoulder Function (10 rds.)			⊗ All guns functioned acceptably	
Accuracy Test @ 100 yards three 5-shot groups (20 rds.)			⊗ All guns tested were within limits except for one .243 Win. Sample.	
Extended Funct. & End. (up to 2,000 rds.)			⊗ No part failures and function was acceptable.	
Hot Temperature (120°F)			⊗ No issues noted.	
Cold Temperature (-20°F)			⊗ Sear on 1 of 2 guns tested momentarily bound, preventing firing.	
Thermal Cycle			⊗ No issues noted.	
Heat & Humidity (120°F / 90% RH)			⊗ No issues noted.	
SAAMI Jar-Off			⊗ All guns Passed.	
SAAMI Rotation			⊗ Samples of Heaviest and lightest configurations were tested & passed.	
SAAMI Drop			⊗ Samples of Heaviest and lightest configurations were tested & passed.	
Field Debris			⊗ No issues noted.	
Dynamic Sand & Dust			⊗ No issues noted.	
FC Dry Cycle (2,000 cycles, lubes at 500 intervals)			⊗ No Fire Control part breakages or significant trends to FC measurement.	
40 lb. Trigger Pull - SAAMI			⊗ Could not overcome the Safety. Passed	
OVERALL TRIAL & PILOT TEST ASSESSMENT			Passed - Issues identified were minor and not related to the new F.C. Mayfield was notified of Accuracy and Magazine Box functional findings and the attention to setting the Trigger Motion on Safe adjustment.	

Figure 4: Results Status by Test

## CONCLUSIONS & RECOMMENDATIONS

Based on the merits of this testing the proposed new fire control design is recommended for implementation on all M/770 variants. Timing of the specific cutover period from the existing to new design is left up to Mayfield to determine based on production readiness and part availability. Minor issues were identified in four areas, two of which were in categories not affected by the fire control. Some rifle specific feeding and magazine retention issues occurred during the 100 rd. Jack Function test which were attributed to the magazine box, and poor accuracy was found on one .234 Win. Youth rifle. It's recommended that Mayfield should review the production processes and quality checks in areas of function and accuracy to maximize performance and yield in these areas to ensure that unacceptable product does not pass through to the customer. In addition one Fire Control was out of specification as received for Trigger Motion on Safe. This was readjusted in Elizabethtown during the Initial Measurement phase prior to test start. Mayfield should review this process and implement changes as needed prior to production start-up to ensure that all guns get adjusted properly. The final yellow rating occurred during the Cold Test on one of two test guns where a malfunction occurred on 3 of 100 rounds fired. The cause of this malfunction was traced to the way the test is conducted and therefore no corrective action is required.

## TECHNICAL DISCUSSION OF RESULTS

Due to the favorable test results generated throughout this testing it was felt that no lengthy discussion of results was required. In addition the Excel file that supports this report (TLW2904 -- 770 Fire Control T&P.xlsx) with data and additional documentation is comprehensive not only in the presentation of data but also contains summary graphs, statistics and specific conclusions for each phase of testing. The worksheets follow the same order that is listed in the Test Matrix and as stated previously can be used as the launching point to "jump" to whatever test results the reviewer desires. An example of the Accuracy Worksheet is shown to show summarized data, statistics, a supporting graph, and a Conclusion(s) section. The [Return to Test Matrix](#) is a hyperlink present in every active worksheet that will return you back to the Test Matrix home worksheet where additional hyperlinks can be used.

### TLW2904 - E (Accuracy)

Date: Five 50-06 & evaluation of 243 & 7mm  
Transaction:

Shots: Three - Five shot groups per gun.

Ammo	R30005	R30005	R30005	R30005	R30005	R7MM2	R7MM2	R243W3	R243W3
Lot	H27 NA1	H27 NA1	H27 NA1	H27 NA1	H27 NA1	J07CD1	J07CD1	H13 ND1	H13 ND1
Caliber	A-1	A-2	A-3	A-4	A-5	A-11	A-12	A-13	A-14
Group #1 (in.)	1.70	2.29	1.21	1.19	2.51	1.50	2.30	1.40	1.17
Group #2 (in.)	1.42	2.00	1.33	1.11	1.92	1.83	0.75	1.80	1.17
Group #3 (in.)	0.94	2.40	1.16	1.30	2.92	2.08	1.38	1.17	1.17
Group Average (in.)	1.35	2.23	1.23	1.17	2.48	1.80	1.48	1.48	1.17
St. Dev. (in.)	0.38	0.17	0.08	0.31	0.47	0.29	0.77	0.32	0.32
Max	1.70	2.40	1.33	1.71	2.93	2.08	2.30	1.80	1.17
Min	0.94	2.00	1.16	1.10	1.96	1.50	0.76	1.17	1.17

Overall Group Statistics by Caliber			
Caliber	Avg (in.)	St. Dev. (in.)	Max (in.)
30-06	1.74	1.64	2.56
7mm RM	0.60	0.55	1.20
243 Win	2.03	2.30	3.78
7mm Win	0.94	0.78	1.17

### Conclusions:

1. Accuracy on all guns met requirements except for A-17. If Gallery tested for accuracy would have been screened out.
2. Overall Results: Not directly related to Fire Control: Passed

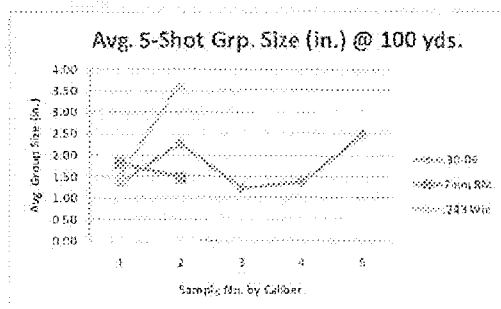


Figure 5: Accuracy Worksheet

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Figure 6 is a picture of the Test Matrix generated for T&P along with summary results and comments for each check, measurement or test. This contains a high level summary of results and also depicts what guns were subjected to what test. No hyperlinks are active in the below picture, you need to have the actual Excel file opened for these to work properly. If the data file was sent along with this report then the following link with find and open this interactive file.

TLW2904 - 770 Fire Control T&P.xlsx

▼ TEST CATEGORY ▼	REPROVER ▼	A-1	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12	A-13	A-14	A-15	A-16	A-17	A-18	A-19	A-20	▼ PROGRESS & RESULT LEGEND ▼
Assembly & Part Conformance	9896AL	7195620	7195622	7195623	7195624	7195625	7195626	7195627	7195628	7195629	7195630	7195631	7195632	7195633	7195634	7195635	7195636	7195637	7195638	7195639	7195640	<input type="radio"/> = Planned <input checked="" type="radio"/> = In-Progress <input checked="" type="radio"/> = Completed with Issues <input checked="" type="radio"/> = Completed, Passed <input checked="" type="radio"/> = Completed, Failed <input checked="" type="radio"/> = Cancelled <input checked="" type="radio"/> = Cancelled, Rescheduled to Different Gun
Operating Malfunction & Bench Function Confirmation	9896AL																					
Reproducible Endurance	9896AL																					
Live-Fire Function & Endurance	9896AL																					
Dynamic Measurements	9896AL																					
Environmental	9896AL																					
Absorb	9896AL																					
▼ TEST DESCRIPTION ▼	DESCRIPTION ▼	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	Synthetic	SS Camo	SS Camo	SS Camo	SS Camo	SS Camo	SS Camo	Youth	Youth	Youth	Youth	▼ COMMENTS / RESULTS ▼
Trigger Pull Force w/ Dvorak (lbs.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = 8.60 lbs., St. Dev = 4.3 lbs., Max = 9.65 lbs., Min = 5.07 lbs. - Passed
Safety Function Check		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All Checks and Function - Passed
Engagement (in.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = 8.112 in., St. Dev = .0012 in., Max = .0336 in., Min = .0290 in. - Passed
Trigger Movement w/ Safety ON (in.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = .0033 in., St. Dev = .0034 in., Max = .0196 in., Min = .0000 in. - Pass / Airt Pl
Trigger Overtravel (in.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = .0105 in., St. Dev = .0031 in., Max = .0207 in., Min = .0103 in. - Passed
Safety Forces (lbs.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Safety "On" to "Off" (lbs.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = 2.70 lbs., St. Dev = .23 lbs., Max = 3.15 lbs., Min = 2.44 lbs. - Passed
Safety "Off" to "On" (lbs.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = 5.78 lbs., St. Dev = .41 lbs., Max = 7.04 lbs., Min = 4.55 lbs. - Passed
Measure Overall Gun Weight (lbs.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = 7.03 lbs., St. Dev = .10 lbs., Max = 7.24 lbs., Min = 6.80 lbs. - For Info. Only
Measure Headspace (Max) (in.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = .0038 in., St. Dev = .0038 in., Max = .005 in., Min = .002 in. - Passed
Proof Test		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All 7mm RM opened hard, Gun A-19 ruptured Case Head, OK after Reproof - Pass
Re-Measuring Headspace (Max) (in.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg = .0039 in., St. Dev = .0039 in., Max = .005 in., Min = .002 in. - Passed
Jack Function Test (100 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg. Malf. Rate = 1.7% (Over 50% of 33 malf on one gun (A-8) - Passed (Not Fr
Shoulder Function (10 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Avg. Malf. Rate = 1.5% (All guns shot clean but gun A-9 bolt catches on rd. - Passe
Accuracy Test (100 rds., Three 3-Shot Guns)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30-06 Avg = 1.74", SD=.69", 7mm Avg = 1.64", SD=.55", 243 Avg = 2.56", SD=1.24"
SAAM Jar Off		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20 guns Tested - All Passed
Ext. Funct. & End. (up to 500 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10 Guns to 500 rds. each; 16% Overall Malf Rate (1 dbl. feed and 7 slam lows) - P
Clean / Inspect / Lubricate / Measure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SAAM Rotation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Three of the heaviest and 3 of the lightest variants tested - All Passed
SAAM Drop		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Three of the heaviest and 3 of the lightest variants tested - All Passed
Ext. Funct. & End. (up to 1,000 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5 Guns tested another 500 rds. each; 0% Malf. Rate for 2,500 rds. fired - Pass
Clean / Inspect / Lubricate / Measure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ext. Funct. & End. (up to 1,500 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 Guns tested another 500 rds. each; 0% Malf. Rate for 1,500 rds. fired - Pass
Clean / Inspect / Lubricate / Measure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Ext. Funct. & End. (up to 2,000 rds.)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2 Guns tested another 500 rds. each; 0% Malf. Rate for 1,000 rds. fired - Pass
Clean / Inspect / Lubricate / Measure		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hot Function		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed
Cold Function		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed - Bear sound preventing firing on 3 of 100 rds. fired
Thermal Cycle		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed
Heat & Humidity		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed
Field Details		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed
Dynamic Shock & Dist		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Passed
TC Cycle		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Completed 5,000 cycles/rea with no FC issues - Passed
30 lb. Trigger Pull / SAAM / Remington		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	SAAM Test - Passed, Remington Trigger Deformation Test - Passed

Figure 6: Test Matrix with Summary Results by Gun

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