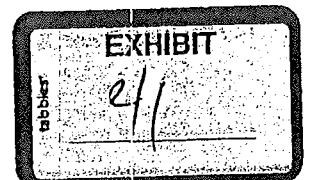


Draft For Legal Review

M/700 Improvement Program
Firecontrol Alternatives

Remington Arms Confidential

Subject to Protective Order - Williams v. Remington



ETE00030986

Abstract

Replacing the M/700 firecontrol while maintaining and/or improving upon its excellent balance of performance and safety has proven to be quite difficult. This report will outline all firecontrols currently under development in terms of concept, status and concerns. In addition overall implementation plans and general concerns will be discussed. Finally, based on information available now a recommendation will be made with regards to program completion.

Remington Arms Confidential

i

Subject to Protective Order - Williams v. Remington

ETE00030987

Abstract.....	i
Firecontrols Under Development.....	1
6-Bar.....	1
Concept.....	1
Status.....	1
Concerns.....	1
7AA.....	1
Concept.....	1
Status.....	2
Concerns.....	2
DW2.....	2
Concept.....	2
Status.....	2
Concerns.....	2
7Y7.....	2
Concept.....	2
Status.....	2
Concerns.....	3
Four by Four (4x4).....	3
Concept.....	3
Status.....	3
Concerns.....	3
Implementation Plan.....	3
Overview.....	3
General Concerns.....	4
Firearms Test Plan Summary.....	4
Physical Measurement.....	4
Proof Testing.....	4
Regain Test.....	4
Safety Pull Test.....	4
Slam Test.....	4
Field Cycle.....	4
Accuracy.....	4
SAAMI Jar Off Test.....	4
SAAMI Drop Test.....	4
SAAMI Rotation Test.....	5
Remington Drop Test.....	5
Remington Rotation Test.....	5
Remington Jar Off Test.....	5
Remington Angled Jar Off Test.....	5
Endurance Testing.....	5
Proof Endurance Test.....	5
Intentional Abuse Test.....	5
Hot and Cold Test.....	5
Field Debris Test.....	5
Direct Placement Test.....	5
Static Sand and Dust Test.....	5
Dynamic Sand and Dust Test.....	6
Water Spray (Rain) Test.....	6
Unlubricated Test.....	6
Oil Residue Test.....	6
Icing Test.....	6
Salt Water Immersion Test.....	6
Solvent Test.....	6
Recommendation.....	6

Firecontrols Under Development

6-Bar

Concept

A systematically balanced multi-bar/multi-link design that has 5 links sandwiched between two side plates (the 6th link or bar). Technologically this type of solution has not been available for more than the last 5 or 6 years. It is only currently available to Remington as a result of hiring Derek Watkins, who did his masters work in multi-bar systems. Operationally, a toggle is positioned 'n' degrees behind vertical, as the trigger is pulled the toggle approaches vertical, immediately past vertical the toggle free falls allowing the firing pin head to "throw" the sear out of the way. This "throwing" of the sear mimics the design goals of the connector in the current M700 firecontrol. When the gun is in safe the firing pin is blocked and the system is guaranteed to be "under" the sear. The safety does not have the range of motion to pull the system back into a position "under" the sear if the trigger is stuck forward. However, in this case the user cannot move the safety into the safe of "S" position. Therefore, making the user aware something is wrong.

From a manufacturing perspective the individual parts will be either MM, PM or stampings. There is one adjustment screw which simultaneously adjusts trigger pull and trigger travel. To absolutely guarantee fit into wood stocks there should be a stock modification for more width above the trigger guard.

Status

Ten prototypes should be ready for Engineering Evaluation Testing (EET) by 4/14/97.

Concerns

Failing slam test is the main problem with the 6-bar. When closing the bolt the firing pin head and sear mate prior to camming the bolt handle down. In this arrangement the green bar (a critical link) is flexing. Since the 6-bar is a linked mechanism, flex looks just like trigger movement. As a result the toggle is moving just past vertical allowing the firing pin head to throw the sear out of the way causing a follow down. The primer is just barely marked; however, SAM1 allows primers to be sensitive enough to ignite at as low as 4 in/oz. Changes made to remove the pre-mate, between firing pin head and sear, have resulted in unacceptable bolt lift forces. Recent changes to the 6-bar might possibly lessen slam sensitivity but far too early to tell.

7AA

Concept

The 7AA is a more conventional trigger, sear firecontrol design with manufacturing adjustments commensurate to current M700 design; however, there are three notable differences. First there is no connector in the 7AA. Second, the sear is split lengthwise in two. One half of the sear maintains its original function, blocking the firing pin head while the other half provides trigger return. The trigger return half of the split sear operates off of the bolt, each time the bolt is operated it forces the trigger back to a guaranteed minimum engagement. The added benefit of this guarantee is that now the trigger is back far enough to guarantee that when the safety is applied the trigger will be guaranteed back in full engagement. Finally, the system employs a trigger block instead of a sear block.

From a manufacturing perspective the individual parts will be either MIM, PM or stampings. There are four adjustment screws: trigger pull, over travel, engagement and trigger block. The 7AA will fit within the current M700 stock envelope without the need for any modifications.

Status

Based on concerns discussed below, the 7AA will require changes which are at this point unknown before being able to enter FET.

Concerns

The 7AA was failing slam test. Changes designed to address slam test resulted in firecontrols that failed jar-off in the butt down position. At this point in time there is no known fix to resolve this issue.

DW2

Concept

Except for the specifics of the design, the DW2 is a trigger block concept like the 7AA. However, the DW2 does not employ a split sear. Therefore it will function much like the G-bar in that if the trigger is stuck fully forward the firearm will not go into safe. To counteract this occurrence the DW2 has two springs working to return the trigger.

From a manufacturing perspective the individual parts will be either MIM, PM or stampings. The DW2 is different from the other firecontrols in that it is actually smaller and has fewer parts than the current M700 firecontrol. There are four adjustments for the DW2: trigger pull, over travel, engagement and trigger block.

Status

The DW2 should be ready to enter FET by 1A1/97.

Concerns

Prior prototypes have failed slam test. A sample of one firecontrol with changes to address this problem has passed slam. Need to begin full scale FET to really know if problems fixed.

7YZ

Concept

The 7YZ is a split sear design like the 7AA except that in addition to blocking the trigger it blocks / lifts the sear as well.

From a manufacturing perspective the individual parts will be either MIM, PM or stampings. Trigger pull is the only adjustment in the 7YZ. However, the safety arm must be select fit to insure sear and trigger block. The 7YZ is not currently retrofitable in the Model Seven.

Status

Initial testing has already begun and is awaiting the approval of the overall test plan.

Concerns

Manufacturing complexity

Four by Four (4x4)

Concept

The 4x4 is like the 6-bar in that it is a multi-link design with 5 links and two sideplates. However, past this generic description the 6-bar and the 4x4 bear little resemblance to one another. First, the 4x4 incorporates a trigger return piece, without the split sear. The trigger return piece, in the 4x4, will provide exactly the same benefits as those described in the 7AA and 7YZ above. Secondly, the links are arranged so that the slam test should not have any effect on the toggle. In addition, there is significantly less sideplate coverage from current M700 design.

From a manufacturing perspective the 4x4 is a simpler design than the current 6-bar design, but in general will require MIM and/or PM and stamped parts. The 4x4 is also smaller than the current 6-bar and as a result should be completely retrofitable. Once again there is one adjustment which covers trigger pull and trigger travel.

Status

A CADDSS V model is complete and kinematic analysis is underway.

Concerns

Everything is theory at this point, there has yet to be one made. Cannot make a January 1998 introduction.

Implementation Plan

Overview

Begin EET testing on the DW2, 7AA and 6-bar when each is ready to enter test. (Completion of EET can not be done without an approved test plan, see General Concerns below). Target would be that by May 23, 1997 R&D would be ready to nominate which of the four current designs manufacturing should focus on if indeed January 1998 introduction becomes a requirement. Regardless of that choice the EET will be taken to completion on all four designs. The information gathered from this test will be invaluable.

Next, allocate an additional \$60,000 to the program and expedite modeling, kinematic analysis, detailing and prototyping of the 4x4 to meet a May 26 two prototype date and a June 30 EET start. Transmit to Lion 4x4 drawings to start capital estimate. Make all preparations, have ordering parts, to enter DAT with the one firecontrol chosen out of the initial four. Once EET is complete on the 4x4 then a decision will be made between the 4x4 and the firecontrol chosen out of the initial four.

General Concerns

- EET and DAT firecontrol testing is scheduled to be run against the entire proposed "Remington Firearms Test Procedures". That test plan has not yet been approved and will soon be an obstacle to EET completion and thus firecontrol selection. (Rewrite)
- Following the above implementation plan January 1998 introduction is not possible. If January 1998 is a requirement, then 4x4 is not a viable option and R&D should only focus on DW2, 7AA, 6-Bar and 7YZ.

Firearms Test Plan Summary

Following is a test by test summary of the proposed "Remington Firearms Test Procedures".

Physical Measurement

Remington standard procedure to visually and dimensionally verify major component design.

Proof Testing

Firing SAAMI specified proof round to empirically verify barrel strength and integrity.

Regain Test

Partially pull trigger and release. Trigger must return from partial pulled position to full engagement.

Safety Pull Test

Remington standard test. Place safety in "safe" position and pull trigger with a specific force. Firearm must not fire.

Slam Test

Remington standard test. Place safety in "fire" position and close bolt sharply. Firearm must not follow down.

Field Cycle

Remington standard test designed to verify function and performance characteristics against specification.

Accuracy

Remington standard test to verify accuracy within performance specification.

SAAMI Jar Off Test

SAAMI standard test. Cock firearm and place safety in "fire" position. Drop firearm from a height of one foot in six different orientations. The firearm must not fire.

SAAMI Drop Test

SAAMI standard test. Cock firearm and place safety in "safe" position. Drop firearm from a height of four feet in six different orientations. The firearm must not fire.

SAAMI Rotation Test

SAAMI standard test. Cock firearm and place safety in "safe" position. Allow firearm to "fall over" from a position of leaning against a vertical surface. The firearm must not fire.

Remington Drop Test

Extension of SAAMI standard test. Firearm will be dropped from heights of 2, 4, 6 and 8 feet. The firearm must not fire.

Remington Rotation Test

Extension of SAAMI standard test. The test is conducted on tile backed by concrete. The firearm must not fire.

Remington Jar Off Test

Extension of SAAMI standard test. Firearm is dropped at 5, 1.5 and 2 feet. The firearm must not fire.

Remington Angled Jar Off Test

Extension of SAAMI standard test. The firearm is at an angle as opposed to level. Firearm must not fire.

Endurance Testing

Remington standard test to determine firearm function life. Life must meet or exceed product specification.

Proof Endurance Test

SAAMI proof rounds fired in an endurance fashion.

Intentional Abuse Test

Remington standard test. Record response to either barrel obstruction or deliberate over pressure loads.

Hot and Cold Test

Remington standard test. Firearm will be function tested at extreme hot and cold ranges. Firearm should perform normally at specified temperature ranges.

Field Debris Test

Firearm / firecontrol subjected to direct placement of specially formulated field debris. Record results.

Direct Placement Test

Firearm / firecontrol subjected to direct placement of sand. Record results.

Static Sand and Dust Test

Based on US Army Test and Evaluation Command, Test operations Procedure 3-2-046. Firearm live fired while being subjected to extreme environmental conditions of dust and debris.

Dynamic Sand and Dust Test

Based on US Army Test and Evaluation Command Test operations Procedure 3-2-045.
Firearm live fired while being subjected to extreme environmental conditions of dust and debris.

Water Spray (Rain) Test

Accelerated test to determine the effects of a heavy rainfall on firearm function.

Unlubricated Test

Determine how firearm functions absent normal lubrication.

Oil Residue Test

Firecontrol subjected to excess oil residue.

Icing Test

Firearm is subjected to simulated freezing rain.

Salt Water Immersion Test

Determine how firearm functions when exposed to accelerated salt water.

Solvent Test

Determine effects of non-standard solvents/cleaners on firearm components and performance.

Recommendation

- Remove January 1998 introduction
- Agree on absolute drop dead date for introduction
- Pick between the 4x4 and one of the four current firecontrol designs