REMINGTON ARMS COMPANY, INC.
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SUBJECT: COMPETITIVE BOLT ACTION STATUS

INTRODUCTION

The Engineering Sample Rifles were further tested and evaluated. The following tests have been completed.

- Safety Operation
- Safety Mechanism Function
- Follow Down
- Extractor Strength
- Cold
- No Lube

In addition, the following tests still remain to be completed.

- Dangerous Combination
- Defective Ammo
- Predictable Misuse
- Vibration

RESULTS

Safety Operation

All safety mechanisms were cycled 200 times. The trigger was pulled harder than normal each cycle with the safety "on" and "off". No firing pins fell with the safety "on".

Safety Mechanism Function

This test determines if the rifle will fire when: The trigger is held back, safety "on", and the bolt is sharply closed. Each rifle was tried ten times. No firing pins fell during this test.

RESULTS Continued

Follow Down Test

This test determines if the rifle will fire when: The trigger is held back, safety "off", and the bolt is closed sharply. Each rifle was tried ten times. No rifle fired, however, all four competitor's rifles did mark the primers while the Remington did not. (See table below)

	Fired Rounds Out of 10	Primer Marked Out of 10	Indentation* Diameter
Browning BBR	0	10	.026
Remington M/700	0	0	—
Ruger M/77	0	10	.017
Smith & Wesson M/1500	0	10	.018
Winchester M/70	0	10	.027

*Avg. of 5

The primer indents were all very light. Therefore, the indentation diameters were measured to better compare the indents between rifles. The indentation depths were all between .0005 and .001 inch. Measurements taken prove the Remington M/700 has the fastest lock-time. This could explain why the M/700 did not mark the primers. A fast lock time keeps the firing pin head in contact with the bolt cam surface during follow down. This could decrease the firing pin energy enough to prevent primer contact. A slow lock time would conserve more firing pin energy since it would not contact the cam surface fully during a fast follow down.

Extractor Strength

This test determines the ultimate extractor strength of Bolt Action Rifles. The measured load is the required force needed to separate the bolt head and extractor from the cartridge rim. Only one measurement per rifle was taken.

	Maximum Force (lbs.)	Type Failure
Browning BBR	940	Broken Claw
Remington M/700 (Rivetless)	680	Bolt Shroud Failed
Ruger M/77	200	Slipped Over Cartridge Rim - Claw Deformed
Smith & Wesson M/1500	280	Slipped Over Cartridge Rim
Winchester M/70	520	Broken Claw

RESULTS Continued

Cold Test

This live ammo test determines a gun's functional characteristics at low temperatures. Each rifle was shot 100 times except the Browning, which was stopped after 59 rounds due to an unsafe condition found during testing. Test temperatures varied from -30°F —— -60°F. The ammo used was Rem. 30-06 Cal., 150 gr. PSP.

	Rounds Fired	Malfunctions	Malf. Rate (%)
Browning BBR	59	1 stem low, 2 light indents, 3 delay fire	10.2
Remington M/700	100	-0-	0
Ruger M/77	100	2 light indents	2
Smith & Wesson M/1500	100	2 stem low, 1 stem right, 1 misfire (*)	3
Winchester M/70	100	6 light indents	6

*Defective round

The Browning was stopped after three rounds delay fired. This was considered an unsafe condition, so further testing was ceased. The rifle would not fire when the trigger was pulled, even though the trigger and sear disengaged. It would fire when jolted or if the operating handle was slightly rotated. It is suspected the firing pin was freezing to the inside bolt body surface.

Lock time could account for the Remington experiencing no light indents. A gun with a faster lock time (fastest firing pin velocity) can more easily overcome the additional firing pin retarding force caused by the freezing condensation inside the bolt body. Light indent depths are listed below.

	Light Indents Depth (in.)	Avg. Indent
Browning BBR	.010, .012	.011
Ruger M/77	.012, .007	.009
Smith & Wesson M/1500	.017	.017
Winchester M/70	.009, .009, .009, .008, .011, .009	.009

RESULTS Continued

Cold Test Continued

The cold affected bolt operation on every rifle, but to different degrees. See table below for comparison between rifles. Rating is relative between rifles.

	Bolt Rotation (up and down)	Bolt Travel (forward & rearward)
Browning BBR	Medium	Hardest
Remington M/700	Hardest	Medium
Ruger M/77	Easiest	Easiest
Smith & Wesson M/1500	Easiest	Easiest
Winchester M/70	Medium	Easiest

No Lube Test

This test evaluates a gun's operating characteristics with no lubrication. Each rifle was shot 200 times & dry cycled. The results are tabulated below. Ammo used was Rem. 30-06 Cal., 150 gr. PSP.

	Rounds Shot	Malfunctions	Malf. Rate (%)
Browning BBR	200	56 did not feed from mag.	28
Remington M/700	200	-0-	0
Ruger M/77	200	-0-	0
Smith & Wesson M/1500	200	3 stem lows, 3 stem rights	3
Winchester M/70	200	-0-	0

The Browning had a problem feeding left rounds from the magazine. The feeding rounds are contacted by part of one bolt locking lug. There is not much coverage here. A stripped trigger guard screw hole further compounded this problem. This prevented a tight fit between the floorplate and the stock which resulted in a lower magazine box position.

All bolts operated slightly harder without lubrication. Remington's initial closing bolt rotation was much harder than the four competitor's rifles. The Remington bolt has a deeper notch just behind the cocking cam surface. This notch holds the firing pin back and prevents it from slipping into the cam cut with the bolt fully opened. A deeper notch here would require more force to cam out of.

RESULTS Continued

No Lube Test Continued

All five rifle bolts bound up from high friction between the cocking cam surface and the firing pin cocking piece. Lubrication was needed to open them. All rifles showed considerable wear in the cam surface and cocking piece areas. Results are tabulated below.

	Cycles to Freeze Up
Browning BBR	220
Remington M/700	100
Ruger M/77	615
Smith & Wesson M/1500	311
Winchester M/70	262

SRF:T
Test & Measurements Lab