— Bolt Action Fire Controls

ALEKSICH

PLAINTIFF'S EXHIBIT 3029

1 of 80

DON'T SAY IT — WRITE IT

File Copy

To Joe Glas

Date 5/22/80

From Clark Jorkman

Attached are a series of memos, reports, letters etc that will give you a feel for our Bolt Action Rifle Fire Control Status. You will note that there is a wide variety of opinions and philosophies expressed. We will be prepared to discuss our present position with you in the near future.

SAFETY IS A WISE INVESTMENT

AL 0016386

1 of 80

DON'T SAY IT—*WRITE IT*

To C.B. WORKMAN ✓ Location

From J.P. GLAS Location Phone No.

Subject Date 5-16-80

There is no ~~record of a policy statement re fire control design goals in the Product~~ Safety file. I have requested a search of the ~~Operations~~ Committee minutes. If you have any records of documentation, please advise.

JPG:jl

REMINGTON ARMS CO.
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MAY 20 1980
ILION RESEARCH DIVISION

RD 778

STOP, LOOK, AND LIVE

AL 0016387

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REMINGTON ARMS COMPANY, INC.
Research Department

xc: R.A. Partnoy
J.E. Preiser
C.B. Workman

Bridgeport, Connecticut
May 16, 1980

E.F. BARRETT

POLICY DIRECTION FOR RESEARCH PROGRAMS
BOLT ACTION FIRE CONTROL IMPROVEMENT

The subject research programs are guided by the following policy guidelines.

1. Design the operation of the bolt lock to operate independently from that of the fire control.

2. Design the fire control so that the bolt can be operated, subject to (1), above, independently from the position of the safety mechanism.

3. Design the fire control mechanisms to be retrofitable.

Point two would allow the user to unload the gun with the safety mechanism in the "ON SAFE" position. It would also allow the user to reload the gun with the safety mechanism in the "FIRE" position.

Please advise of your agreement, with, or suggestions for modifications to the policy.

JPGlas:jl

REMINGTON ARMS COMPANY, INC.
Research Department

cc: J.P. McAndrews
E. Sparre
R.A. Partnoy
E.G. Larson
T.J. Sharpe
J.G. Williams

TO: R.L. HALL
C.B. WORKMAN
R.B. SPERLING
W.E. LEEK
J.P. LINDE
J.S. MARTIN
A.A. HUGICK

FROM: E.P. DARRELL

SUBJECT: PRODUCT SAFETY MEETING - BOLT ACTION FIRE CONTROLS
APRIL 23, 1975

This meeting was held to develop plans to conduct a safety analysis of bolt action fire controls.

The following is a summary of the status reports given by each Department and their plans for further action.

RESEARCH

The investigation to date has been largely confined to the Model 600. An investigation has also been made of the M/788 and the M/580 series fire controls. Research has completed an analysis of the design of the M/600 fire control and has -

1. Changed part dimensioning to insure adequate lift of the sear by the safety cam.

2. Specified hardening the fire control housing to minimize wear between the detents.

3. Increased the length of the safety lever cam.

These modifications are being tested to evaluate their effectiveness and to insure there is no interaction with the other aspects of fire control performance.

Research has concluded that the present design for a 3-position safety is inadequate and plans to begin a study during the second half of 1975 to develop a new safety mechanism.

MARKETING

Approximately 600 Model 600 rifles are expected to be returned to the Plant as the result of the special quality audit.

Marketing will review the available information on all bolt action rifles as it relates to the safety performance of bolt action fire controls. This will include gunsmith reports, arms repair data, parts usage, etc.

PRODUCTION

Inspection of 147 Model 600 rifles returned for the safety audit show the following.

1. Safety cannot be "tricked" - 103

2. Safety can be "tricked" but movement of safety lever to full "safe" position clears trigger connector and sear and gun will not fire when moved to "off" position - 40

3. Safety can be "tricked"; trigger connector remains disengaged from sear when moved to "safe" position and gun will fire when the lever is moved to "off" position - 4

4. Trigger can be set in unsafe condition when safety lever is in "safe" position - 0

Production is rejecting guns which fall in the #2, #3 and #4 categories. Indications are that this provides an ample safety factor that wear will not lead to the category #4 situation during the life of the gun.

A gauge is being developed that will permit checking for sear lift at assembly.

Production is analyzing variations in purchased and internally manufactured parts and reviewing quality control procedures and limits. A list of recommendations for improving quality performance will be developed and reviewed by the Product Safety Committee.

A follow-up meeting is scheduled for the week of May 19.

EFB/ab
4/25/75

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RD-41-B

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

Xc: E.F. Barrett
A.A. Hugick

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

Ilion, New York
May 7, 1975

TO: W. E. LEEK

FROM: J. P. LINDE

SUBJECT: EVALUATION OF THE BOLT ACTION RIFLE SAFETY MECHANISMS M/580s, 788, 600 and 700

This investigation was instituted when a Model 600 was returned from Texas by a customer who in the process of unloading his gun moved the safety lever from the on safe to off safe position (so the bolt could be actuated) and the gun discharged. Upon further investigation of the incident it was determined that he had pulled the trigger with the safe in the on position. It was also determined that some Model 600s could be tricked by putting the safety lever in an intermediate position half way between on safe and off safe, pulling the trigger, releasing the trigger, push the lever to the off safe position and the gun will fire.

Model 600

The M/600 safety is a blocked sear design. The safety lever rotates a cam under the sear, lifting the sear off its contact with the trigger-connector. The trigger then can be pulled with no effect to the sear or firing pin assembly. In the guns in question it was found that they had inadequate sear lift on both the on safe and intermediate positions. The sear lift is the amount of clearance generated between the trigger-connector and the sear. The lifting action of the cam on the safety lever takes place when the safety lever is rotated to the on safe position. On the guns in question there was very little clearance between the sear and trigger-connector. Thus when the trigger was pulled in a certain way when the gun was on safe, the connector would not return with the trigger. In this case the safety cam is preventing the gun from firing, thus when the safety is moved to the fire position the gun will discharge.

The initial production remedy was to swage the cam on the safety lever to provide greater lift on the sear. The greater lift provides a bigger clearance between the trigger connector and sear when the gun is in the on safe condition. The trigger can be pulled without any fear of the connector failing to return due to inadequate lift. The final inspectors, assemblers and customer repair people were reinstructed on what to look for. A test has been added at assembly to check for the sear lift from the safety actuation by use of a shim stock.

The guns are being checked to give at least .008 inches min. lift between the trigger-connector surface and the sear.

The holes on the fire control housing on some of the samples tested were out of control. Corrective action is being taken.

Proposed Design and Process Changes

Design

1. The safety levers have been redimensioned to give better manufacturing control of critical dimensions.

2. The dimensions on the safety lever cam were changed to give greater lift on the sear and maintain the lift longer when the safety is moved from "on safe" to "off safe".

3. The fire control housing will be changed to be common with the Model 700. It has two separate side plates which are riveted together, while the 600 has a folded assembly. The M/700 housing has a heat treated side plate with the detent hole, which gives more positive safety. The folded assembly is not heat treated and the detent holes wear and become less positive.

4. The sear has to be altered to eliminate a potential interference with the rear housing assembly pin.

Process

1. A production gage has been designed and is being built which will measure the sear lift due to the safety lever operation before the fire controls are assembled to the gun.

2. An inspection hole has been added to the new design safety lever so the cam form and its position on the safety lever can be readily inspected in purchase parts inspection.

Test Program - M/600

The current M/600 being manufactured with the swaged safety levers are being tested. They are shot with live ammunition at the start of the test to check their function. The amount of sear lift from the safety operation is measured before the start of the test as well as the force to put safe on and off. The guns are being dry cycled safe on-safe off and cock and dry fire to 50,000 cycles each. The sear lift is being measured every 5,000 cycles to determine how wear affects the sear lift over the life of the gun. The wear on the detent system, trigger connector and sear surfaces also will be checked. The test is being duplicated in a dry and oiled (WD40) condition on the trigger mechanism.

The testing will be duplicated for the redesigned fire control. From this and the original testing it is being determined the minimum safe sear lift for new guns. This report will be followed by the test report.

Status of Design Change

The design has been determined and all drawings have been completed. Design test confirmation is under way. The new drawings have been submitted to P.E. & C. for estimating purposes and the appropriate vendors contacted. As soon as the design test is satisfactorily completed the drawings will be transmitted.

Proposed Future Plans - M/600 & 700

A design investigation will be started to determine the feasibility of changing the safety design from a blocked sear system to a blocked firing pin system. The benefits of a three position safety also are being investigated.

The spring force on the detent system on the M/600 & 700 varies due to the leaf spring design, which can vary the safety operating force. The design will be reviewed to see if the system can be altered to give a more constant operating force.

Model 788 and 580 Series

The problem came to light in February when the design was changed from a blocked trigger system to a blocked sear system similar to the 600 and 700 design. This design change was instituted to standardize parts in these guns with the 540 Series, to eliminate a high scrap operation, and to obtain a more positive safety.

Model 788 and 580 Series Continued

When the problem appeared all the parts involved in the safety mechanism were measured to determine why there was insufficient sear lift. The following items were found:

1. The powder metal trigger was out of tolerance. Powder Metal has been contacted.
2. The safety lever dimensioning did not tie the critical dimensions together.
3. The holes in the trigger housing were not to locational dimension.

Corrective Action Taken to Maintain Production

1. The triggers were ground to provide more clearance when the safety was operated.
2. The gaging technique was established to measure the sear lift with the safety operation when the gun is assembled.
3. All the assemblers were reinstructed on what to look for -- proper lift and can the gun be tricked.

Corrective Action Being Taken

1. Correct the parts out of gage and establish controls.
2. Redimension safety levers for both the 580 Series and 788 to tie the critical surfaces together. The vendor has been contacted on what surfaces are critical and how they can best be maintained.
3. The dimensions on the safety lever were altered to give greater lift to insure in all tolerance conditions there is adequate lift with an allowance for wear.
4. Process Engineering is designing a gage to measure the sear lift from the safety lever operation to insure that the fire control will have adequate lift before it is assembled to the gun.

Corrective Action Being Taken Continued

5. The assemblers will use a feeler gage to measure sear lift to make sure a minimum lift is maintained.

6. The safety lever hold down screw has been deleted. The pin with the retaining ring presently used in the pivot pin will be used instead of the screw. The alteration was made after it was determined under some conditions the screw could back out and bind the safety operation.

7. The cut in the bottom of the M/788 receiver for safety lever clearance has been altered in the proposed design to eliminate any potential interference with the safety lever which could block the safety operation.

8. An inspection hole will be added to the M/788 fire control housing so the sear lift can be visually checked.

Test Program - M/580 Series and 788

Production guns with ground triggers are being tested to make sure there will be no field problems with the powder metal surfaces wearing down with usage. These guns are being tested in the following way.

1. The 580 Series are being shot to 20,000 rounds and dry cycled safe on - safe off to 400 cycles.

2. Another gun will be dry cycled to 50,000 safe on - safe off cycles and 50,000 cock and fire cycles.

The new design is being tested by swaging out and recutting the safety lever to the new dimension. The gun test will include;

1. One gun will be shot 2,000 times, with 500 safe on - safe off cycles, the sear lift being measured every 500 rounds as well as the safe on - safe off actuation load.

2. One gun will be cycled to 50,000 safe on - safe off cycles, and 50,000 cock and dry fire cycles.

These tests will be repeated with the design changes as they become available.

Future Program

1. The 540 Series fire controls will be altered to reflect the changes made in the M/580 and 788 fire controls.

2. ~~The sear pin will be~~ looked into as one backed out in testing. This is presently ~~a substitute~~ pin and will be changed to a spirol pin as soon as the testing can be completed on the new pin. When the solid pin ~~backed out~~ after about 20,000 cycles it resulted in a fire on safe ~~condition.~~ The pin slipped out of one side of the housing, letting the sear slip down. When the safety was positioned to the on safe position there was inadequate lift, so if the trigger is pulled it will ~~become trapped~~ ahead of the sear. When the safety is moved to the fire position the gun will discharge.

JPLinde:T
Ilion Research Division

DO NOT DISTRIBUTE

September 7, 1977
Rev. September 9, 1977
Rev. October 11, 1977

BOLT ACTION SAFETY SYSTEM ANALYSIS

This report is a summary of the information accumulated in a design analysis of the popular current bolt action safety systems. The systems are listed as to how they function, with a description of the design advantages and disadvantages.

Blocked Trigger Safety

This safety works on the principle of employing a mechanical means to block the rotation of the trigger. The trigger is the only element in the triggering mechanism which is blocked. This type of safety has been utilized extensively in hunting type rifles and shotguns. The M/1100, M/870, and M/742 utilize this type of safety.

The blocked trigger safety has the following advantages:

1. It is easy to determine how the mechanism operates even by a novice shooter.
2. The safety operation is not dependent on the position of the striker or some other integral part. The safety can be operated with the bolt open, bolt closed, or striker cocked or fired on all of our current models which use the common fire control such as the M/742. With all the bolt action rifles which use the blocked trigger safety, the safety can only be put in the "On Safe" position when the striker is cocked. The bolt can be either in the open or locked position. The bolt lock feature normally inhibits the operation of the safety if the bolt is in the open position.

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Blocked Trigger Safety - Cont'd.

The blocked sear safety can normally not be moved to the "On Safe" position when the striker has fallen. The blocked striker type safety cannot be actuated unless the rifle is cocked and the bolt locked closed.

3. The blocked trigger safety locks the trigger in position; if the shooter fidgets with the rifle while he is waiting for a big trophy deer the trigger will remain locked unless the safety is repositioned. With a safety system where the trigger is free to move if the hunter fidgets with the rifle and pulls the trigger with the safety in the "On Safe" position, the trigger could possibly bind on the trigger guard, stock, or trigger housing. If this happened, the rifle would fire "off safe".
4. The designer has much greater freedom on where the physical position of the safety can be located with this type of safety. With the blocked striker or blocked trigger safety, the physical position of the safety mechanism is determined by where the force has to be applied to cam the striker or sear.

The blocked trigger safety has the following disadvantages:

1. In firearms where the trigger directly supports the sear (trigger surface engages sear surface to inhibit rotation), the tolerances and clearances in the trigger block (safety) allow movement when the trigger is pulled with the firearm in the "On Safe" position, decreasing the amount of sear trigger engagement.

Blocked Trigger Safety - Cont'd.

1 A. In the common fire control, as used on the M/1100 and M/870, and M/742, there is a connecting link between the trigger and sear. The design calls for a clearance between the link and sear engagement surface which, when the trigger is pulled with the firearm in the "On Safe" position, allows the trigger to move slightly taking up the tolerances and clearances in the safety block without moving the sear. The trigger is allowed to retract when released which allows the safety to be actuated regardless of the position of the sear.

2. The blocked trigger design does not lend itself to target triggers as a target trigger demands a minimum preplay or initial clearance and a minimum engagement. If the trigger has a connecting link the trigger would normally have preplay. If the trigger connects directly to the sear the engagement cannot be decreased to target specifications as the safety tolerances and clearances are such as not to insure an adequate engagement if the trigger were pulled with the firearm in the "On Safe" position.

Blocked Sear Safety

This type of safety functions by having a mechanical means block the sear or cam the sear clear of the trigger. In this type of mechanism where the sear is disconnected from the trigger a mechanical cam is actuated against the sear, lifting the sear away from the trigger by actuation of the safety lever. The M/700 rifle uses a safety mechanism of this design. In the M/700 system when the sear is cammed free of the trigger the sear cams the striker assembly, retracting the firing pin slightly.

The blocked sear safety has the following advantages:

1. The system can be used successfully with either a hunting rifle or a target rifle. Because the system lifts the sear clear of the trigger, the system is not as sensitive to the amount of sear engagement as the blocked trigger safety.
2. The system blocks the striker, camming it rearward slightly.
3. The safety can be operated with the bolt in the open position or in the closed and cocked position.

4. The safety lever can be positioned in a convenient location.

5. The system is positive -- mechanical actuating means physically disconnecting sear from trigger. The trigger can be pulled with high force levels not affecting the safety operation.

6. The striker is blocked by the sear and will take a large amount of abuse without firing.

7. The sear, trigger and safety cam all are attached to the same housing making the system less tolerance sensitive.

8. Can be designed either as a two position or three position safety.

The blocked sear safety has the following disadvantages:

1. If the customer fidgets with the trigger when the gun is in the "On Safe" position and the trigger fails to return to position, the safety mechanism (can) will be holding the striker and when it is switched to the fire position the striker will fall. The trigger could be bound by the stock, trigger housing, trigger guard, or insufficient clearance between trigger and sear.

2. The rifle cannot be put in the "On Safe" position when the striker is forward.

Blocked Striker System

The system is actuated by camming the striker rearward with a mechanism located on the bolt plug. The M/70 Winchester utilizes this type of system.

Advantages of blocked striker system:

1. Can be designed as a two or three position safety system.
2. This type of safety holds or retains the last link in the firing mechanism. This could possibly be an advantage under drop test curcumstances and for advertising or sales appeal.

Disadvantages of the blocked striker system:

1. Located in a position which interferes with scope mounted rifles.
2. The system is very tolerance sensitive as the mechanism parameters are determined by the sear position located in the receiver assembly and the camming mechanism located in the bolt assembly.
3. - The mechanism can only be actuated when the bolt is closed and cocked. To load the rifle with the safe in the "On Safe" position requires closing the rifle, putting the safe in the "On Safe" position, opening the bolt and loading the rifle. If one shot is fired and the following shot fed from the magazine, the bolt must be locked in the fire position before the safety can be actuated.
4. If the hunter fidgets with his rifle, squeezing the trigger while the rifle is in the "On Safe" condition, the trigger could possibly lock back from binding on the trigger housing, stock, trigger guard, or excessive dry lubrication and cause the rifle to fire when the safe is moved to the "On Safe" position.

SAFETY LEVER LOCATION

The safeties located on the bolt plug normally are difficult to actuate with scoped rifles.

The safety buttons located on the top center of the tang are very difficult to operate when the bolt is in the rear open position. If the hunter carries his rifle with his hand around the grip he could inadvertently reposition the safety without realizing it, with the safety positioned on the top tang.

The safety buttons located on the trigger bow are easy to actuate but tend to be confusing as to which is the safe position.

The safeties located along the side of the receiver are easy to actuate, do not interfere with the gun operation, but normally work in the same direction as the trigger. This could cause a problem if the customer previously operated a Winchester M/94 lever action where to put the gun on half cock he has to pull the trigger while retarding the fall of the hammer with his thumb. If the customer pulls the trigger while releasing the safety with a blocked sear safety the rifle will naturally fire.

Safety Design

The safety should have two clearly defined positive positions; "ON SAFE" and "OFF SAFE". The safety should require 3 to 10 pounds to move to the "Off Safe" position. The safety mechanism should not be overly sensitive to lubrication; that is, the actuation forces should not vary dramatically due to lubrication.

The safety mechanism should have an endurance life such that it will not wear to create a dangerous condition. The safety clearances and checks performed at the plant should allow for wear.

The operation of the safety mechanism should be easily understood by the customer without consulting the owner's manual.

The safety lever or button should not protrude in such a manner where it can be easily knocked out of position. The safety should not be positioned such that operation of the bolt or some other member is in line with the safety such that it could be repositioned by said mechanism operation. An example would be having the safety lever project up on the right rear tang such that operating the bolt handle back and forth by the customer could reposition the safety.

The safety operation should not be noisy such that its operation will scare off game animals.

If a clearance or interference is required in the mechanism it should be in a place where it can be readily inspected and understood by the people servicing the firearm.

With the safety in the "On Safe" position the rifle should tolerate a 30 pound pull on the trigger without firing.

The safety mechanism should be able to withstand a drop test without repositioning itself ~~in all six~~ planes.

The safety should allow the rifle to be loaded and unloaded with the safety in the "On Safe" position.

Three position safeties can be confusing to a new shooter. What does the center or middle position mean? 1/2 safe. The motion required on a three position safety to go from the fire to the middle position is the same as the total motion in a two position safety to obtain an equivalent mechanical advantage. The motion required on the three position safety from the second to third position must be substantial to allow for a positive central detent position. It is easier to develop and manufacture a two position detent system which goes from stop to stop than it is to develop a three position system where the mechanism is supposed to stop in an intermediate position.

People who own three position safeties leave them in the intermediate position so they can operate them quicker.

Bolt Locks

A bolt lock is important to insure proper function of a bolt action rifle. The bolt lock holds the bolt in the ready position to insure that the protruding bolt doesnot catch on some object and partially unlock the action. If the action becomes partially unlocked the rifle will not fire when the trigger is pulled as the firing pin head will bottom on the cam surface on the bolt before the tip can impinge on the shell primer. To insure the rifle is ready to fire, particularly when hunting dangerous game, it is important to incorporate a bolt lock into a bolt action rifle. If the bolt catches on an obstacle it can unlock the rifle, unloading the action.

January 19, 1977

FIRE CONTROL DESIGN CONSIDERATIONS
- BOLT ACTION RIFLES -

Tolerances

Fire Controls have many interacting parts. And their function requires minimum part movement. Because of this, tolerance buildup is the key problem in designing Fire Controls for mass production. This tolerance buildup problem can be solved in a variety of ways:

- Adjust tolerance buildup out by screw adjustment, bending, swaging, or filing.
- Have several parts sizes in inventory for a selective fit.
- Eliminate the tolerance buildup by performing a manufacturing operation during final assembly. For instance, a critical hole could be drilled during assembly using the assembly up to that point as a fixture.
- Design parts which can move a lot, to move even more to take up tolerance buildups.
- Parts whose function is not critical to safety can be toleranced statistically.

Safeties

Block Trigger Safety

This Safety blocks the movement of the Trigger. The Trigger, in turn, blocks the movement of the Sear which blocks the Firing Pin. When the Safety is disengaged the Trigger may be pulled to fire the rifle. In my opinion this is the ultimate Safety because it blocks all of the functions required to fire the rifle.

This type of Safety will not work on a target type Trigger because the Sear engagement might be adjusted too fine for the tolerances in the Safety. Then the rifle could be shot with the Safety on.

Safeties - Contd.

Lift Sear Safety

This Safety lifts the Sear clear of the Trigger and blocks it so that, when the Trigger is pulled, it can not release the Sear. This Safety is used on rifles where the Trigger movement is too small to effectively block. It is especially useful on target rifles.

Problems can occur with this Safety if the Trigger binds. Foreign material in the Fire Control, or a bad trigger fit, can cause the Trigger to stick in the "pulled" position. When the Safety is released, there is nothing to support the Sear, so the rifle fires off safe.
This Safety requires more throw than a block trigger safety. This is because it has to do considerable work to lift the Sear against the mainspring force.

A Lift Sear Safety must have constant force camming between the Safety and the Sear. So that the Safety "on" force will be consistent in all tolerance situations.

Bolt Safety or Block Firing Pin Safety

This Safety lifts the Firing Pin from the Sear and blocks it. A binding Trigger will also cause a rifle with this type of Safety to fire "off" safe.

Safety Detents

Safety detents provide the following functions:

- Controls Safety "on" and "off" forces
- Provides positive position stops for Safety "on" and "off"
- Insures no "dead" positions between "on" and "off" where the Safety might otherwise hang up.

The force required to initiate movement of the Safety depends upon the detent spring thrust and the "contact" angle of the detent head. These work together

Safety Detents - Contd.

to create the "feel" of the Safety. The "contact" angle is the angle of the surface that the Safety Lever has to work against to retract the detent. It is defined by 1/2 the included angle of a conical detent head. It can also be defined by the tangent angle where a ball detent contacts the hole it is sitting in.

I have successfully tested detents with conical heads whose included angle was 60° (contact angle of 30°). I found that these detents should be supported at both sides of the Fire Control Housing to eliminate binding.

The contact angle can be varied between the "on" and "off" positions. This is done by having two different size detent holes with a ball detent or a conical detent with a hemispherical tip.

Trigger

The Trigger should have the following characteristics:

- Balanced so that it cannot be jarred off
- Pull 3 - 5# or adjustable 1 - 5# for target Triggers
- Sear engagement adjustable for target rifles
- Over travel minimum or adjustable for target rifles
- An optional 3-bar system can be designed for target rifles to minimize Trigger movement.

Sear

- Engagement with Trigger - .015" Min. (except for target rifles)
- Engagement with Cocking Piece - .010" Min. (worst tolerance condition)

Bolt Release

The Bolt Release can sometimes be operated by the Safety.

On some rifles the Sear can also serve as a bolt stop.

Fire Control Mounting

The Fire Control must be strongly attached to the Receiver. This joint should not yield when Fire Control parts are being changed while the Fire Control is attached to the Receiver.

Critical Dimensions

After the Fire Control is designed the following dimensions have to be checked. They should be checked by drawing and/or calculation to ensure safe operation under all tolerance conditions:

- Sear-Cocking Piece engagement .010" minimum
- Sear Lift* (on sear lift type safety) - .008" minimum

* Be sure to include sear rotation allowed by sear pivot pin fit! This happens if the Sear is lifted from the side so that it can become cocked.

E. J. YOUNG/nl
Ilion Research Division
Manual Firearms Design

4/5/77

M/600 FIRE CONTROL

In January 1975 R&D was advised of a problem existing with the M/600 Fire Control. Initial investigation of the fire control and components showed several out of telerance conditions existing. The parts found to be out of telerance are:

SEAR SAFETY CAM – Safety cam surface.
.534 / .539 dim. and connector contact area
.341 / .346 dim. over max.

TRIGGER – Pivot hole in trigger
.991 / .973 dim. was found to be out of position over max.

TRIGGER CONNECTOR – This part was found to have a blow in the long leg of the part.

TRIGGER HOUSING – The following holes were found out of position –
Safety Pivot hole .649 / .651 & 1.305 / 1.307
Safety Detent Holes
Trigger Pivot holes .839 / .841 & 1.239 / 1.241
Holes were out of position also had variations from side to side.

Correction of these tolerance conditions was easily accomplished as two of the four parts are made here.

SEAR SAFETY CAM – Is manufactured by Hi–Dense. It was found that by exercising more care in pressing and sintering this part could be made to model drawing tolerance.

TRIGGER – Also made by Hi–Dense with final maching by Rem. This part was brought back into tolerance by minor alteration of fixturing and reinstruction of the operator.

TRIGGER CONNECTOR – Manufactured outside – this part was brought back into tolerance by having the vendor make alteration on die.

TRIGGER HOUSING – This part was found to have the most out of tolerance conditions. This part can be controlled but it is necessary for both Rem. and vendor to screen and check all parts. Doing this increases piece price. Parts are also checked at Sub–Assembly to insure proper sear connector separation with safe in "ON SAFE" position.

Reason for change to M/700 Style Fire Control Housing.

Hardened low wear housing

More Positive safety

Eliminate trigger housing rejects at safety clearance inspection.

Common Housing – (M/600, M/700 M/40X)

PARTS CHANGED OR REDESIGNED

Housing – Altered to fit M/600 and M/700 receivers.

Safety Lever and Sear Safety Cam – Altered to provide a longer duration of safety and more lift – sear and connector separation.

Future plans for this Fire Control, the XP–100 Fire Control and the M/700 Fire Control are: Continue to upgrade and improve them, include a unload on safe feature, a three position safe or both. This will probably be dictated by Marketing.

FEMartin:bd

4 / 5 / 77

M/79C BOLT LOCK (NEW DESIGN) 3/18/81
ERO

ESTIMATION OF ADDED OPERATIONAL COST.

NEW COMPONENTS:

	EQUIPMENT	COST/GUN
BOLT PLUG (ADDED COST TO PRESENT PROCESS)	*118,120.00	.168
BOLT LATCH (P/M ~~QUOTE~~)	4,400.00	~~.540~~ .150
PLUNGER		** .030
SPRING		** .010
PIN		** .005

ADDED OPERATIONS TO EXISTING COMPONENTS:

BOLT ASSEMBLY	3920.00	.028
FIRING PIN ASSEMBLY		
ASSEMBLE LATCH IN BOLT PLUG	785.00	.072
	*127225.00	~~.853~~ * .467

AL 0016412

* INCLUDES 7½% EQUIPMENT COST ** BASED ON SIMILAR PART COSTS

11,790 Bolt Lock (New Design) 3/18/81
ERC

Bolt Plug (New)
Operation-26 (Added To Present Process)

8-Station Dial Type ~~Transfer~~ Machine

Basic Machine With Hydraulics And All Controls	40,000.00
8-Drilling Heads @ $5,000.00 Each *	40,000.00
2-Milling Heads @ $7,500.00 Each *	15,000.00
8-Fixtures And Tooling	17,000.00
	$112,000.00

Gages

3-Plug Gages @ $40.00 Each	120.00
1-Pinning Gage (Hole Location)	2000.00
1-Race Gage (Milled Cuts)	4000.00
	$6120.00

Total Capital --- $118,120.00

Machine Cycle Time --- 20 Sec. **
Production Rate @ 80% 144 Parts/Hr. Capacity
Employee Rate/hr. 7.90 + 45% (Fringe) = 11.455
(Operator Uncovers Part While Waiting) 11.455/144 = .0795/Part
7½% Of $118,120.00 = $8859.00
$8859.00/100,000 = .0886/Part
Total — .1681/Part

Note: Design Cost Included

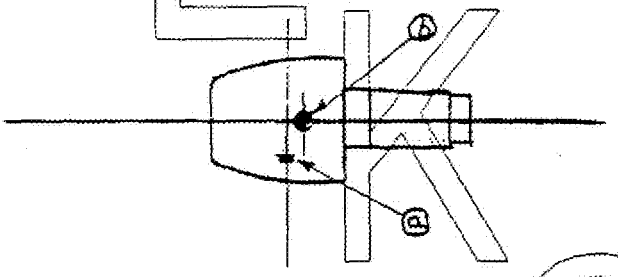
* Includes Mounts ** Includes Load Time

M/700 Bolt Lock (New Design) 3/18/61
EFS

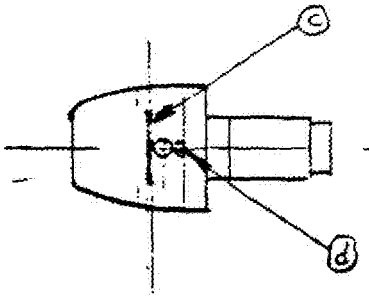
Bolt Plug (New)
Operation - 26 - Description

8 - Station Dial Type ~~Transfer~~ Machine. (Load at Sta. 1)

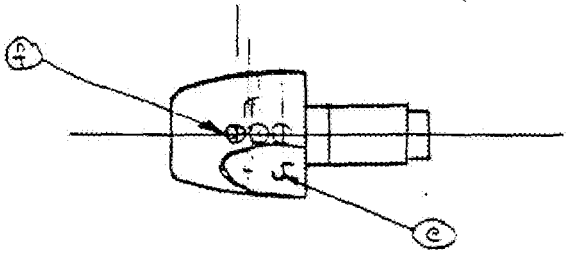
Sta. 2 - Ⓑ Butt Drill Bolt Latch Pivot Hole & Ⓐ Rough Drill Latch Slot (Center)



Sta. 3 - Ⓒ Drill B.L.P.H & Ⓓ Rough Drill Latch Slot (Front)



Sta 4 - Ⓔ Mill Right Side (M/Doc B.A.C.) & Ⓕ Rough Drill Latch Slot (Rear)



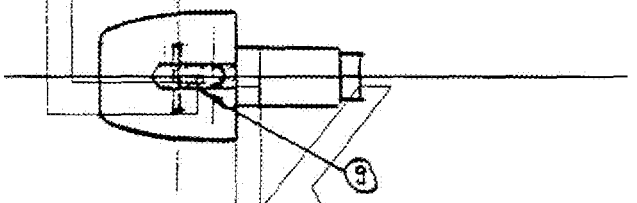
M/700 BOLT LOCK (NEW DESIGN) 3/18/81

ECO

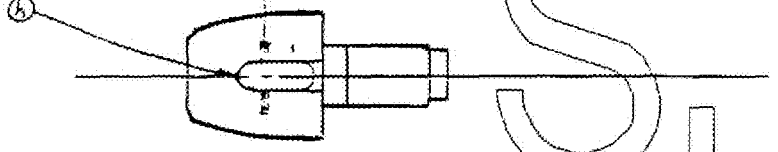
BOLT PLUG (NEW)

OPERATION 20 - DESCRIPTION CONT'D.

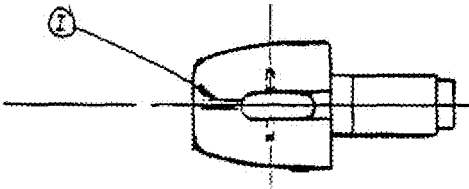
STA. 5 - ⑨ MILL LATCH SLOT



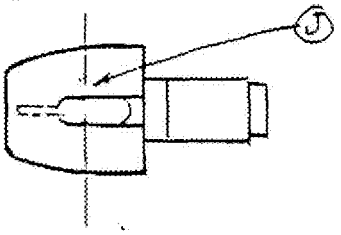
STA. 6 - ⓗ BUTT DRILL SPRING PLUNGER HOLE



STA. 7 - ⓘ DRILL SPRING PLUNGER HOLE



STA. 8 ⓙ REAM B.L.P.H.



n/700 Bolt Lock (New Design) 3/18/81
ECO

Bolt Ass'y. (Added Operation)
Operation-238

Machine - 0-12 Cinn. _____

Tooling - Special T-Cutter 70.00

Fixture - Vertical ~~Vee~~ Block 2500.00

Gages
1- Position Gage (Functional Go-Nogo) 950.00
1- Depth Gage - Flush Pin Type 400.00
Total Capital - $3920.00

Machine Cycle Time ---- 12 Sec.
Load Time - - - - - - - - 8 Sec. 20 Sec.
Production Rate @ 80% = 144 Parts/Hr. Capacity
Employee Rate/hr. 7.90 + 45% (Fringe) = 11.455

Based On 8 Sec. Employee Time Added Cost = .025/Part

$3600/11.455 = 8/x \quad x = \frac{8(11.455)}{3600}$

7½% of $3920.00 = $294.00

294.00/100,000 = .0029/Part

Total — .0279

M/700 Bolt Lock (New Design) 3/13/81
ERO

Firing Pin Assembly (Assm. Latch In Bolt Rua)
Operation - 100 (New)

Fixture - ~~Locate On~~ Firing Pin Head Hole.	650.00
Part Handling Tools - (Magnetic)	125.00
Hand Held Drill - Clean Out Spring Plunger Hole	10.00
Total Capital -	$785.00

Cycle Time ——————— - 18 Sec.
Production Rate @ 80% = 160 Parts/Hr.
Employee Rate/Hr. 7.90 + 45% (Fringe) = 11.455

Based On 18 Sec. Employee Time Added Cost = .0716/Part
11.455/160 = .0716

7½% of $785.00 = 58.875
58.875/100,000 = .0006/Part
Total — .0722/Part

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

RESEARCH MEETING

November 1, 1978

SUBJECT: BOLT ACTION FIRE CONTROL

A meeting was held on the above subject with the following people in attendance:

C.B. Workman	E.J. Young	T.P. Powers
A.A. Hugick	D.E. Bullis	P.Nasypany
J. S. Martin	G.D.Bailey	J.W. Brooks

An explanation of the M/600 recall program was given by Clark Workman.

The present fire control was discussed using a diagram to explain its operation.

The various safeties, their positions on rifles and how they operated (what they blocked) were discussed. This included competitive models. The discussion then proceeded to what our future thinking should be on our fire controls. Is our present system satisfactory? Can we make a better system?

The outcome of the ensuing discussion produced the following criteria as a start for looking at future designs:

1. The mechanical lock type "ON SAFE" - "OFF SAFE" safety control should be retained.

2. Trigger must be pulled to fire rifle - pulling trigger is only way rifle will fire - rifle will fire immediately when trigger is pulled.

3. Rifle (can - must) be unloaded with the mechanical safety (No. 1 above) in the "ON SAFE" position.

4. Bolt handle must be locked down with safety in "ON SAFE" position with round in chamber.

An example of No. 2 above that was discussed was to have a second trigger that had to be pulled before the primary trigger could be pulled. The secondary trigger would block the sear or other mechanism until pulled with a predetermined force through a specific distance and then continued movement would pull the primary trigger to fire the rifle.

In No. 3 above the discussion covered whether the rifle "can" or "must" be unloaded in the "ON SAFE" position. At the meeting of the Design Group on Nov. 7, opinions will be given for reaching a decision.

J. W. Brooks:T
Manual Firearms Design
Ilion Research Division

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

Present: C.B.Workman, J.S.Martin, E.J.Young, D.E.Bullis, G.D.Bailey, F.E.Martin, T.P.Powers, P.Nasypany, J.W.Brooks, D.R.Lewis

RESEARCH MEETING

November 7, 1978

SUBJECT: BOLT ACTION FIRE CONTROL

Observations

1. "Can" or "Must" condition on unloading a rifle in "ON SAFE" position. Majority feel a "Must".

2. Unload magazine box without cycling thru chamber?

3. Gun must be safe when unloaded!

Further Criteria

1. Bolt handle must be locked down with round chamber and safe on.

2. Rifle must be unloaded with safe on.

3. Trigger feel safely adjustable by customer.

JW Brooks:T
Manual Firearms Design
Ilion Research Division

REMINGTON ARMS COMPANY, INC.
Research Department

c: J.P. McAndrews
E.G. Larson

Bridgeport, Connecticut
November 16, 1978

C.B. WORKMAN
M.H. ~~WALKER~~
J.P. ~~LINDE~~
H.D. ALBAUGH-W.H. FORSON

BOLT ACTION FIRE CONTROL - DESIGN REVIEW 11-14-78

- A gauge is being designed to check sear lift. The gauge is expected to be positive and simple enough to be used in the field. Completion of a prototype gauge is scheduled for mid-December.

- The following design requirements for a new fire control for bolt action rifles were tentatively established -

  1. Eliminate the "trick" condition. At this point the best solution appears to be adding a trigger block to the safety cam mechanism. This would prevent the trigger from moving in the "safe" position - eliminating the "fail to reset" possibility.

  2. The new fire control should be retrofittable.

  3. A bolt lock arrangement should be provided. At this point a locking device separate from the fire control appears most desirable.

  4. Adjustment for the trigger pull force should be provided for the user. Access to the adjustment should not require stock removal. Other adjustments - sear-connector engagement - should be eliminated.

- Program

  1. Marketing will conduct consumer tests of the fire control designs now in hand during December and January. These include a three position and a two position safety with an external bolt lock. A sample with the present fire control with the bolt lock removed will be included.

2. Research will complete the design investigation and select a design approach by February 1, 1979.

3. Consideration will be given to introducing the new design in a limited quantity of restyled M/600s in 1980.

- M.H. Walker will prepare a letter with his views on renaming the "safety" ~~mechanism~~.

E. F. Barrett

EFBarrett:jl

DON'T SAY IT—*WRITE IT*

700 BDL

	w/o Buttock	w/ Buttock	Δ
Std Depth -	25.17	25.81	.64
Std Width -	39.49	39.92	.43
			1.07

"SAFETY RULES ARE PERFECT TOOLS"

AL 0016423

Copies to: R. L. Hall
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File

October 24, 1980

G. D. CAMPBELL

M/700 Bolt Latch Mechanism

Evaluation of the proposed Bolt Latch mechanism for M/700 rifles indicates it will result in a $3.00 increase in unit factory cost (full allocation basis) in its first year (1982). For comparison purposes, a 1982 M/700 "Line Before" and three alternative "Line After" results were developed based on M/700 cost performance during the first six months of 1979. These alternatives were:

1. Adding of the Bolt Latch mechanism without adjusting prices.
2. Adding the Bolt Latch mechanism and adjusting prices to maintain the percent pretax margin.
3. Adding the Bolt Latch mechanism without adjusting prices, but deleting the sling and swivels from the BDL grade to compensate for the increased cost.

The results of these evaluations are summarized in the attached table which shows weighted average unit prices, costs, and pretax earnings and the project results. This data has been adjusted to anticipated 1982 price and cost levels.

As shown in this table, Alternative III is the most attractive in % margin, earnings, and net return on investment because it results in a net reduction in costs and working capital requirements. One disadvantage of this alternative is that ADL and Classic grade earnings are adversely affected, and the results shown depend on maintaining current product mix.

Alternative II also results in increased earnings, however, its net return on investment is substantially lower because of additional working capital requirements resulting from increased costs and sales.

All alternatives require project expenditures of $249M construction and $83M in operations charges. Detailed data for the line before and each alternative are attached.

J. C. Hutton

J. C. Hutton, Superintendent
INDUSTRIAL ENGINEERING SECTION

by T. R. Andrews
TRA/mc
Att.

	1982 Line Before	Alternative I Without Price Adjustment	Alternative II With Price Adjustment	Alternative III With Sting Deleted From BDL
		1982 Line After		
Retail Selling Price	$ 411.28	$ 411.28	$ 419.09	$ 411.28
Net Selling Price	220.55	220.55	224.74	220.55
Factory Cost	158.05	161.05	161.05	155.89
Total Cost	183.75	186.62	187.23	181.68
Pretax Earnings - Unit	36.80	33.93	37.51	38.87
Line	$ 5,123 M	$ 4,723 M	$ 5,221 M	$ 5,410 M
% of Net Selling	16.7%	15.4%	16.7%	17.6%

Project Results

Pretax Earnings

Full Allocation	--	($400M)	$ 98M	$ 287 M
Incremental	--	($310M)	$223M	$ 275 M

Net Earnings

Full Allocation	--	($204M)	$ 52M	$ 150 M
Incremental	--	($158M)	$117M	$ 144 M

Net Return on Investment

Full Allocation	--	Negative	8.6%	202.7%
Incremental	--	Negative	19.7%	187.0%

M/700 Line Before - 1992

T20
10/21/92

	M/700 ADL	M/700 BDL	M/700 Classic	Line Before (M$) Book	Line Before (M$) Incremental	Weighted Ave
Quantity	66,636	99,398	4,176	139,210	139,210	139,210
Retail Selling Price	$358.14	$439.72	$402.55	57,254		$411.28
Net Selling Price	$192.05	235.80	215.97	30,702	30,702	$220.55
Standard Material	$ 31.46	$ 39.49	$ 32.89	5,096	5,096	
Material Variance	3.93	4.88	4.08	627	627	
Standard Labor	22.36	25.17	23.55	3,366	3,366	
Labor Variance	13.27	15.12	13.21	2,011	2,011	
Direct Expense	2.47	25.60	25.24			
Gas & Power	2.24	2.52	2.36			
Industrial Relations	17.06	19.30	17.61			
Gratus Repairs	.85	.91	.95			
Total Direct Chgs.	$ 42.59	$ 48.83	$ 46.06	6,461	6,431	
Supervision	2.16	2.42	2.30			
Industrial Relations	1.03	1.16	1.09			
Factory Clerks	.27	.30	.29			
Industrial Engineering	.30	.33	.32			
Depreciation	3.16	3.58	3.35			
PE & C Direct	.20	.22	.21			
Floor Space	2.34	2.62	2.48			
Project Cost	.90	1.01	.95			
Other Direct	.28	.31	.29			
Total Mfg O/H	$ 10.64	$ 11.94	$ 11.28	1,599	—	
Sub-Total	$124.14	$144.93	$131.77	18,150		
Plant Overhead	21.87	25.35	23.60	3,359	—	
Unadjusted Factory Cost	$146.01	170.28	$154.77	22,509	17,551	
Factory Cost (Adj. for Cost Red)	$142.73	$166.43	$151.29	20,002	17,156	159.05
Selling & Administrative	14.60	17.92	16.41	2,334	921	16.76
Technical	2.69	3.30	3.02	430	154	3.09
Distribution	3.65	4.48	4.10	583	363	4.19
Cost Before Admin. Exp	163.67	192.15	174.82		18,599	
Total Cost	$164.89	$194.03	$176.59	25,579	19,119	$183.75
Earning Before Admin. Exp.	29.38	43.65	41.05		12,103	
Less: Admin Exp	1.22	1.88	1.77	230	520	1.66
Pretax Earnings	$ 27.16	$ 41.77	$ 39.28	5,123	11,583	36.80
Less: Tax						
plus: Amortized ITC						
Net Earnings						
Pretax Margin	14.1%	17.7%	18.2%			16.7%

AL 0016426

M/100 LINE AFTER WITH BOLT LATCH - 1982

WITHOUT PRICE ADJUSTMENT

-20

	M/100 ADL	M/100 BDL	M/100 CLASSIC	LINE AFTER (MS's) BOOK	LINE AFTER (MS's) INCREMENTAL	WEIGHTED AVE.
QUANTITY	46,634	89,398	4,176	139,210	139,210	139,210
RETAIL SELLING PRICE	$358.14	$439.72	$402.55	57,254		$411.29
NET SELLING PRICE	$192.05	$235.90	$215.97	30,702	20,702	$220.55
STANDARD MATERIAL	$ 31.89	$ 39.92	$ 33.42	5,156	5,156	
MATERIAL VARIANCE	3.89	4.93	4.13	634	634	
STANDARD LABOR	25.00	25.82	24.20	3,456	3,456	
LABOR VARIANCE	13.52	15.37	13.46	2,046	2,046	
DIRECT EXPENSE	22.74	25.90	25.54			
GAS & POWER	2.20	2.58	2.42			
INDUSTRIAL RELATIONS	17.49	19.73	18.04			
GRATUS REPAIRS	.97	.93	.87			
TOTAL DIRECT CHGS.	43.40	49.14	46.87	6,564	6,564	
SUPERVISION	2.22	2.48	2.36			
INDUSTRIAL RELATIONS	1.06	1.18	1.12			
FACTORY CLERKS	.28	.31	.30			
INDUSTRIAL ENGINEERING	.31	.34	.33			
DEPRECIATION	3.29	3.71	3.48		18	
PE & C DIRECT	.21	.23	.22			
FLOOR SPACE	2.41	2.69	2.55			
PROJECT COST	.93	1.04	.99			
OTHER DIRECT	.29	.32	.30			
TOTAL MFG O/H	11.00	12.30	11.64	1,649	18	
SUB-TOTAL	126.69	141.48	133.72	19,505	17,874	
PLANT OVERHEAD	22.32	25.00	24.05	3,422	-	
UNADJUSTED FACTORY COST	149.01	173.28	157.77	22,927	17,874	
FACTORY COST (EXT. FOR COST RED)	145.73	169.45	154.29	22,436	17,479	161.05
SELLING & ADMINISTRATIVE	14.60	17.92	16.41	2,334	921	16.76
TECHNICAL	2.69	3.30	3.02	430	154	3.09
DISTRIBUTION	3.65	4.48	4.10	583	369	4.19
COST BEFORE ADMIN. EXP	166.67	195.15	177.82		18,923	
TOTAL COST	$167.76	$196.90	$179.46	25,979	18,423	$196.62
EARNING BEFORE ADMIN. EXP	23.38	40.65	38.05		11,780	
LESS: ADMIN EXP	1.09	1.75	1.64	212	507	1.53
PRETAX EARNINGS	$ 24.29	$ 38.90	$ 36.41	4,723	11,278	$ 38.92
LESS: TAX						
PLUS: AMORTIZED ITC						
NET EARNINGS						
PRETAX MARGIN (% OF NET SELLING)	12.6%	16.5%	16.9%			15.4%

AT 0016427

M700 Line After with Bolt Latch - 1982

Prices Adjusted to Maintain % Margin

	M/700 ADL	M/700 BDL	M/700 Classic	Line After (M's) Book	Line After (M's) Incremental	Weighted Avg
Quantity	44,436	90,398	4,176	139,210	139,210	139,210
Retail Selling Price	$365.95	$447.53	$410.36	58,341		$419.09
Net Selling Price	$196.24	239.99	220.06	31,285	31,285	$224.74
Standard Material						
Material Variance						
Standard Labor						
Labor Variance						
Direct Expense						
Gas & Power						
Industrial Relations						
Gratus Repairs						
Total Direct Chgs.						
Supervision						
Industrial Relations						
Factory Clerks						
Industrial Engineering						
Depreciation						
PE & C Direct						
Floor Space						
Project Cost						
Other Direct						
Total Mfg O/H						
Sub - Total						
Plant Overhead						
Unadjusted Factory Cost						
Factory Cost (Adj. for Cost Red)	$145.73	$169.45	$154.39	23,420	17,479	$161.05
Selling & Administrative	16.91	18.24	16.72	2,378	939	17.08
Technical	2.74	3.36	3.08	438	156	3.14
Distribution	3.73	4.56	4.18	594	375	4.27
Cost Before Admin. Exp	167.11	195.61	179.27		18,949	
Total Cost	$168.36	$197.52	$180.07	26,064	19,470	$187.23
Earning Before Admin. Exp	29.13	44.38	41.79		12,336	
Less: Admin. Exp	1.25	1.91	1.80	234	530	1.69
Pretax Earnings	$27.88	$42.47	$39.99	5,221	11,806	$37.51
Less: Tax						
plus: Amortized ITC						
Net Earnings						
Pretax Margin (% of Net Selling)	14.2 %	17.7 %	18.2 %			16.7 %

Same As Line After Without Price Adjustment

AL-0016428

M/700 LINE AFTER WITH BOLT LATCH

WITHOUT PRICE ADJUSTMENT

SLING & SWIVELS DELETED FROM BDL GRADE

	M/700 ADL	M/700 BDL	M/700 CLASSIC	LINE AFTER (MS's) BOOK	LINE AFTER (MS's) INCREMENTAL	WEIGHTED AVE
QUANTITY	46,636	88,399	4,176	139,210	139,210	139,210
RETAIL SELLING PRICE	$359.14	$439.72	$402.55	57,254		$411.28
NET SELLING PRICE	$192.05	$235.80	$215.87	30,702	30,702	$220.55
STANDARD MATERIAL	$31.89	$33.65	$33.42	4,601	4,601	
MATERIAL VARIANCE	3.89	4.16	4.13	566	566	
STANDARD LABOR	23.00	23.81	24.20	3,456	3,456	
LABOR VARIANCE	13.53	15.37	13.46	2,046	2,046	
DIRECT EXPENSE	22.74	23.89	25.54			
GAS & POWER	3.30	2.58	2.42			
INDUSTRIAL RELATIONS	17.49	19.72	19.04			
GRATUS REPAIRS	.97	.93	.87			
TOTAL DIRECT CHGS.	43.40	48.12	46.87	6,562	6,562	
SUPERVISION	2.22	2.48	2.36			
INDUSTRIAL RELATIONS	1.06	1.18	1.12			
FACTORY CLERKS	.28	.31	.30			
INDUSTRIAL ENGINEERING	.31	.34	.33			
DEPRECIATION	3.29	3.71	3.48		18	
PE * C DIRECT	.21	.23	.22			
FLOOR SPACE	3.41	2.69	2.55			
PROJECT COST	.93	1.04	.98			
OTHER DIRECT	.29	.32	.30			
TOTAL MFG O/H	11.00	12.30	11.64	1,649	18	
SUB-TOTAL	126.69	140.41	133.92	18,980	17,249	
PLANT OVERHEAD	22.32	24.56	24.05	3,312	—	
UNABSORBED FACTORY COST	149.01	164.97	157.97	22,192	17,249	
FACTORY COST (ADT. COR COST DEV)	145.73	161.33	154.29	21,702	16,868	155.89
SELLING & ADMINISTRATIVE	14.60	17.92	16.41	2,334	921	16.76
TECHNICAL	2.69	3.30	3.03	430	154	3.09
DISTRIBUTION	3.65	4.49	4.10	583	368	4.19
COST BEFORE ADMIN. EXP	166.67	187.03	177.82		18,311	
TOTAL COST	$167.76	$189.13	$179.46	25,292	18,844	$181.60
EARNING BEFORE ADMIN. EXP	25.38	48.77	38.05		12,391	
LESS: ADMIN EXP	1.09	2.10	1.64	243	533	1.75
PRETAX EARNINGS	$24.29	$46.67	$36.41	5,410	11,858	$38.87
LESS: TAX						
PLUS: AMORTIZED ITC						
NET EARNINGS						
PRETAX MARGIN (% OF NET SELLING)	12.6%	19.8%	16.9%			17.6%

AL-0016429

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October 24, 1980

C. D. CAMPBELL

M/700 Bolt Latch Mechanism

Evaluation of the proposed Bolt Latch mechanism for M/700 rifles indicates it will result in a $3.00 increase in unit factory cost (full allocation basis) in its first year (1982). For comparison purposes, a 1982 M/700 "Line Before" and three alternative "Line After" results were developed based on M/700 cost performance during the first six months of 1979. These alternatives were:

1. Adding of the Bolt Latch mechanism without adjusting prices.

2. Adding the Bolt Latch mechanism and adjusting prices to maintain the percent pretax margin.

3. Adding the Bolt Latch mechanism without adjusting prices, but deleting the sling and swivels from the BDL grade to compensate for the increased cost.

The results of these evaluations are summarized in the attached table which shows weighted average unit prices, costs, and pretax earnings and the project results. This data has been adjusted to anticipated 1982 price and cost levels.

As shown in this table, Alternative III is the most attractive in % margin, earnings, and net return on investment because it results in a net reduction in costs and working capital requirements. One disadvantage of this alternative is that ADL and Classic grade earnings are adversely affected, and the results shown depend on maintaining current product mix.

Alternative II also results in increased earnings, however, its net return on investment is substantially lower because of additional working capital requirements resulting from increased costs and sales.

All alternatives require project expenditures of $249M construction and $83M in operations charges. Detailed data for the line before and each alternative are attached.

J. C. Hutton

J. C. Hutton, Superintendent
INDUSTRIAL ENGINEERING SECTION

by T. R. Andrews
TRA/mc
Att.

	1982 Line Before	Alternative I Without Price Adjustment	Alternative II With Price Adjustment	Alternative III With Sling Deleted From BDL
		1982 Line After		
Retail Selling Price	$ 411.28	$ 411.28	$ 419.69	$ 411.28
Net Selling Price	220.55	220.55	224.74	220.55
Factory Cost	158.05	161.05	161.05	155.89
Total Cost	183.75	186.62	187.23	181.68
Pretax Earnings - Unit	36.80	33.93	37.51	38.87
Line	$ 5,123 M	$ 4,723 M	$ 5,221 M	$ 5,410 M
% of Net Selling	16.7%	15.4%	16.7%	17.6%

Project Results

Pretax Earnings

Full Allocation	--	($400M)	$ 90M	$ 287 M
Incremental	--	($310M)	$223M	$ 275 M

Net Earnings

Full Allocation	--	($204M)	$ 52M	$ 150 M
Incremental	--	($150M)	$117M	$ 144 M

Net Return on Investment

Full Allocation	--	Negative	8.6%	202.7%
Incremental	--	Negative	19.7%	187.0%

ALTERNATIVE 2

M/700 LINE AFTER WITH BOLT LATCH 1982

WITHOUT PRICE ADJUSTMENT

-20

	M/700 ADL	M/700 BDL	M/700 CLASSIC	LINE AFTER (M&S) BOOK	LINE AFTER (M&S) INCREMENTAL	WEIGHTED AVE
QUANTITY	46,636	88,298	4,176	139,210	139,210	139,210
RETAIL SELLING PRICE	$359.14	$439.72	$402.55	57,254		$411.29
NET SELLING PRICE	$192.05	$235.80	$215.87	30,702	30,702	$220.55
STANDARD MATERIAL	$31.89	$39.92	$33.42	5,156	5,156	
MATERIAL VARIANCE	3.88	4.93	4.13	634	634	
STANDARD LABOR	23.00	25.83	24.20	3,456	3,456	
LABOR VARIANCE	13.32	15.37	13.46	2,046	2,046	
DIRECT EXPENSE	23.74	25.50	25.54			
GAS & POWER	2.80	2.58	2.42			
INDUSTRIAL RELATIONS	17.49	19.73	18.04			
GRATUS REPAIRS	.87	.93	.87			
TOTAL DIRECT CHGS.	43.40	49.14	46.87	6,564	6,564	
SUPERVISION	2.22	2.48	2.36			
INDUSTRIAL RELATIONS	1.06	1.18	1.12			
FACTORY CLERKS	.28	.31	.30			
INDUSTRIAL ENGINEERING	.31	.34	.33			
DEPRECIATION	3.29	3.71	3.48		119	
PE & C DIRECT	.21	.23	.22			
FLOOR SPACE	2.41	2.69	2.55			
PROJECT COST	.93	1.04	.98			
OTHER DIRECT	.29	.32	.30			
TOTAL MFG O/H	11.00	12.30	11.64	1,648	18	
SUB - TOTAL	126.69	141.48	133.72	18,506	17,374	
PLANT OVERHEAD	22.32	25.80	24.05	3,422	-	
UNABSORBED FACTORY COST	149.01	173.28	157.77	22,927	17,874	
FACTORY COST (EXT. FOR COST PER)	145.73	169.45	154.29	22,420	17,479	161.05
SELLING & ADMINISTRATIVE	14.40	17.92	16.41	2,334	921	16.76
TECHNICAL	2.69	3.30	3.02	430	154	3.09
DISTRIBUTION	3.65	4.48	4.10	583	368	4.19
COST BEFORE ADMIN. EXP	166.67	195.15	177.82		19,922	
TOTAL COST	$167.76	$196.90	$179.46	25,979	19,429	$196.62
EARNING BEFORE ADMIN. EXP	25.38	40.65	35.05		11,780	
LESS: ADMIN EXP	1.09	1.75	1.64	212	307	1.33
PRETAX EARNINGS	$24.29	$38.90	$36.41	4,723	11,273	$33.93
LESS: TAX						
PLUS: AMORTIZED ITC						
NET EARNINGS						
PRETAX MARGIN (% OF NET SELLING)	12.6%	16.5%	16.9%			15.4%

AL 0016433

Alternative II

Line After with Bolt-Ons - 1982

Prices Adjusted to Maintain 7% Margin

	M/700 ADL	M/700 BDL	M/700 Classic	Line After (MSS) Book	Line After (MSS) Incremental	Line After (MSS) Weighted Ave
Quantity	46,436	29,398	4,176	139,210	139,210	139,210
Retail Selling Price	$365.95	$447.53	$4101.36	58,341		$419.09
Net Selling Price	$196.241	239.99	220.06	31,285	31,285	$224.74
Standard Material						
Material Variance						
Standard Labor						
Labor Variance						
Direct Expense						
Gas & Power						
Industrial Relations						
Gratus Repairs						
Total Direct Chgs.						
Supervision						
Industrial Relations						
Factory Clerks						
Industrial Engineering						
Depreciation						
PE & C Direct						
Floor Space						
Project Cost						
Other Direct						
Total Mfg O/H						
Sub-Total						
Plant Overhead						
Unabsorbed Factory Cost						
Factory Cost (Incl. for Cost Red)	$145.73	$169.45	$154.29	22,420	17,479	$161.05
Selling & Administrative	14.91	19.24	16.72	2,379	339	17.08
Technical	2.74	3.36	3.08	436	156	3.14
Distribution	3.73	4.56	4.18	594	375	4.27
Cost Before Admin. Exp	167.11	195.61	178.27		18,949	
Total Cost	$168.36	$197.52	$180.07	26,064	19,479	$187.23
Earning Before Admin. Exp	28.13	44.38	41.79		12,336	
Less: Admin Exp	1.25	1.91	1.80	234	530	1.69
Pretax Earnings	$27.88	$42.47	$39.99	5,221	11,806	37.51
Less: Tax						
plus: Amortized ITC						
Net Earnings						
Pretax Margin (% of Net Selling)	14.2%	17.7%	18.2%			16.7%

Same As Line After Without Price Adjustment

AL 0016434

ALTERNATIVE II

M/700 LINE AFTER WITH BOLT LATCH

WITHOUT PRICE ADJUSTMENT

SLING & SWIVELS DELETED FROM BDL GRADE

	M/700 ADL	M/700 BDL	M/700 CLASSIC	LINE AFTER (MS's) BOOK	LINE AFTER (MS's) INCREMENTAL	WEIGHTED AVE
QUANTITY	6,230	38,398	4,176	139,210	139,210	139,210
RETAIL SELLING PRICE	$369.14	$439.72	$402.55	371,254		$411.28
NET SELLING PRICE	$192.05	$225.80	$215.80	30,702	30,702	$220.55
STANDARD MATERIAL	$31.89	$33.65	$33.42	4,601	4,601	
MATERIAL VARIANCE	3.88	4.16	4.13	566	566	
STANDARD LABOR	23.00	25.91	24.20	3,456	3,456	
LABOR VARIANCE	13.52	15.37	13.46	2,046	2,046	
DIRECT EXPENSE	22.74	25.89	25.54			
GAS & POWER	2.30	2.58	2.42			
INDUSTRIAL RELATIONS	17.49	19.72	18.04			
GRATUS REPAIRS	.87	.93	.87			
TOTAL DIRECT CHGS	43.40	49.12	46.87	6,562	6,562	
SUPERVISION	2.23	2.48	2.36			
INDUSTRIAL RELATIONS	1.06	1.18	1.12			
FACTORY CLERICS	.28	.31	.30			
INDUSTRIAL ENGINEERING	.31	.34	.33			
DEPRECIATION	3.29	3.71	3.48		18	
PE & C DIRECT	.21	.23	.22			
FLOOR SPACE	2.41	2.69	2.55			
PROJECT COST	.93	1.04	.98			
OTHER DIRECT	.29	.32	.30			
TOTAL MFG O/H	11.00	12.30	11.64	1,649	18	
SUB-TOTAL	126.69	140.41	133.72	18,080	17,249	
PLANT OVERHEAD	22.32	24.56	24.05	3,312	—	
UNARTIMATED FACTORY COST	149.01	164.97	157.77	23,192	17,249	
FACTORY COST (EXT. FOR COST PER)	145.73	161.33	154.29	21,702	16,866	155.89
SELLING & ADMINISTRATIVE	14.60	17.92	16.41	2,314	921	16.76
TECHNICAL	2.69	3.30	3.02	430	154	3.09
DISTRIBUTION	3.65	4.49	4.10	593	368	4.19
COST BEFORE ADMIN. EXP	166.67	187.03	177.82		19,311	
TOTAL COST	$167.76	$189.13	$179.46	25,392	18,944	$191.69
EARNING BEFORE ADMIN. EXP	25.38	48.77	38.05		12,391	
LESS: ADMIN EXP	1.09	2.10	1.64	243	538	1.95
PRETAX EARNINGS	$24.29	$46.67	$36.41	5,110	11,853	$30.87
LESS: TAX						
PLUS: AMORTIZED ITC						
NET EARNINGS						
PRETAX MARGIN (% OF NET SELLING)	12.6%	19.8%	16.9%			17.6%

AL 0016435

4/200 Box-Latch Mechanism
Cost Breakdown

— 3 August 1980

Standard Material	$.43	(Estimated)
Material Variance	.05	(@ 12.2% - historical ratio)
Standard Labor	.65	(Estimated)
Labor-Variance	.25	(38.6% - calculated by department based on 1979 experience)
Direct Charges	.30	(Estimated)
Industrial Relations	.43	(@ 47.9% of Labor + Labor-Variance)
Other-Direct Expense	.08	(Calculated based on historical maint. repair and gas & power ratios)
Additional Depreciation	.13	(@ 4.5% of project estimate)
Other Manufacturing Overhead	.23	(Calculated based on historical ratios)
Sub-Total	2.55	
Plant Overhead	.45	(@ 17.5% of subtotal - historical ratio)
Total Cost	$3.00	

AL 0016436

M/700 Bolt Latch Mechanism
Cost by Component

T.R. Andrews
12/11/80

Component	Standard Material	Standard Labor	Direct Charges
Bolt Latch (new part 2 drill press operations heat treat & color)	$ .168	$ .115	$ .028
Bolt Plug (existing part + 3 special machine operations & deburr)	—	.377	.169
Bolt Assembly (existing part + 1 mill oper.)	—	.053	.101
Firing Pin Assembly (existing part + assem. oper)	—	.092	.0001
Detent Plunger (new part heat treat & color)	.234	.0004	.0004
Detent Plunger Spring (new part)	.013	—	—
Detent Retaining Pin (new part)	.011	—	—
Final Assembly (added inspection element)	—	.014	—
Total	$ .426	$ .6514	$ .2995

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington PETERS

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

cc: C. B. Workman
J. S. Martin
F. E. Martin
E. R. Owens

April 8, 1981

To: T. L. Capeletti

From: L. W. Bower JWB

Re: M/700 Bolt Lock - Manufacturing Costs

In October, 1980, Industrial Engineering issued a report on the cost of the M/700 Bolt Lock based on a PE & C estimate. Because of the seemingly high cost to manufacture this feature, the Research Process Development Group was asked to review. Exhibit 1 shows a comparison of costs based on estimates prepared by PE & C, Research, and a hypothetical best case.

The major difference between the Research and PE & C estimate is the labor cost to make the extra cuts in the Bolt Plug. PE & C estimated two special machines, the Research estimate provides for 1 machine, and, therefore, less labor input. This $.21 difference is multiplied when labor variance, industrial relations, and overhead are added to it.

The "best case" condition assumes that the pin hole in the Bolt Latch can be moved so that the powder metal blank can be made to include the hole. This $.11 savings in the direct cost to drill the hole is again multiplied by the various overhead accounts.

Two other approaches are possible. If a high strength plastic could be substituted for powder metal in the Bolt Latch, it may be possible to reduce the total cost of the feature by an additional $.20 below the "best case". Finally, the possibility of an investment cast Bolt Plug could be investigated. It would be necessary to eliminate all of the added cuts in the investment cast blank, however, to show any significant savings.

JWB:ws
Firearms Research Division
Attach.

Exhibit 1

M/700 BOLT LOCK

MANUFACTURING COSTS

	PE&C	R&D	BEST CASE
Standard Material			
Bolt Latch	.17	.15	.15
Detent Plunger	.02	.02	.02
Detent Plunger Spr.	.01	.01	.01
Detent Retaining Pin	.01	.01	.01
Total	.21	.19	.19
Material Variance (12.2%)	.03	.02	.02
Standard Labor			
Bolt Latch	.12	.12	.01
Bolt Plug	.38	.17	.17
Bolt Assembly	.05	.03	.03
Firing Pin Assembly	.09	.07	.07
Final Assembly	.01	.01	.01
Total	.65	.40	.29
Labor Variance (38.6%)	.25	.15	.11
Industrial Relations (47.9%)	.43	.26	.19
Misc. Direct Exp (3.8%)	.06	.04	.03
Depreciation (7.5% Capital)	.13	.07	.07
Manufacturing Overhead (10%)	.18	.12	.09
Plant Overhead (17.5%)	.34	.22	.17
Price/Gun	$2.28	$1.47	$1.16

AL 0016439

54 of 80

DON'T SAY IT—*WRITE IT*

To T.L. CAPELETTI Date 12/22/80

From G.D. CAMPBELL

RE: M/700 BOLT LATCH MECHANISM - Costs

Attached are I.E. worksheets detailing the cost of adding this feature. If you have questions or wish to discuss this further, please contact me.

GDC:js
Attach.

"SAFETY RULES ARE PERFECT TOOLS"

A

M109 Bolt Latch Mechanism
Cost by Component

T-2 Increase
12/31/80

Component	Standard Material	Standard Labor	Direct Charges
Bolt Latch (new part, 3 drill press operations, heat treat & color)	$ .168	$ .115	$ .038
Bolt Plug (existing part + 3 special machine operations & deburr)	—	.377	.169
Bolt Assembly (existing part + 1 mill oper.)	—	.053	.101
Firing Pin Assembly (existing part + assem. oper.)	—	.092	.001
Detent Plunger (new part, heat treat & color)	.234	.0004	.0004
Detent Plunger Spring (new part)	.013	—	—
Detent Retaining Pin (new part)	.011	—	—
Final Assembly (added inspection element)	—	.014	—
Total	$ .426	$ .6514	$ .2095

AL 0016441

4/700 Bolt Latch Mechanism
Cost Breakdown

T.R Andrews
12/1/80

Standard Material	$ .43	(Estimated)
Material Variance	.05	(@ 12.2% - historical ratio)
Standard Labor	.65	(Estimated)
Labor Variance	.25	(38.6% - calculated by department based on 1979 experience)
Direct Charges	.30	(Estimated)
Industrial Relations	.43	(@ 47.9% of Labor + Labor Variance)
Other Direct Expense	.08	(Calculated based on historical fixture repair and gas & power ratios)
Additional Depreciation	.13	(@ 7.5% of project estimate)
Other Manufacturing Overhead	.23	(Calculated based on historical ratios)
Sub-Total	2.55	
Plant Overhead	.45	(@ 17.5% of sub-total - historical ratio)
Total Cost	$ 3.00	

AL 0016442

DON'T SAY IT—*WRITE IT*

To T.L. CAPELETTI Date 12/22/80

From G.D. CAMPBELL

RE: M/700 BOLT LATCH MECHANISM - Costs

Attached are T.E. worksheets detailing the cost of adding this feature. If you have questions or wish to discuss this further, please contact me.

GDC:js
Attach.

"SAFETY RULES ARE PERFECT TOOLS"

AL 0016443

M/1000 Bolt Latch Mechanism
Cost by Component

T. R. Anderson
12/17/80

Component	Standard Material	Standard Labor	Direct Charges
Bolt Latch (new part 3 drill press operations heat treat & color)	$ .168	$ .115	$ .238
Bolt Plug (existing part + 3 special machine operations & deburr)	—	.377	.169
Bolt Assembly (existing part + 1 mill oper.)	—	.053	.101
Firing Pin Assembly (existing part + assem. oper.)	—	.092	.0091
Detent Plunger (new part heat treat & color)	.234	.0004	.0004
Detent Plunger Spring (new part)	.013	—	—
Detent Retaining Pin (new part)	.011	—	—
Final Assembly (added inspection element)	—	.014	—
Total	$ .426	$ .6514	$ .3995

AL 0016444

4/700 Bolt Latch Mechanism
Cost Breakdown

T.R. Andrews
2/17/80

Standard Material	$.43	(Estimated)
Material Variance	.05	(@ 13.2% - historical ratio)
Standard Labor	.65	(Estimated)
Labor Variance	.55	(38.4% - calculated by department based on 1979 experience)
Direct Charges	.30	(Estimated)
Industrial Relations	.43	(@ 47.9% of Labor + Labor Variance)
Other Direct Expense	.08	(Calculated based on historical gas & power ratios)
Additional Depreciation	.13	(@ 7.5% of project estimate)
Other Manufacturing Overhead	.23	(Calculated based on historical ratios)
Sub-Total	2.55	
Plant Overhead	.45	(@ 17.5% of subtotal - historical ratio)
Total Cost	$3.00	

AL 0016445

[illegible]

Title BAC BOLT LOCK

Date 5-2-80

Originated by Z. KOWALSKI

[illegible] Copies to: [illegible]

ALL FIGURES IN $

	CAP.	OPER.			
1 DEVELOPMENT					
Investigation					
Design					
Model Making					
Design testing					
Models, for test					
Development [illegible]					
Development [illegible]					
[illegible]					
2 PRODUCT ENGINEERING					
Process eng. & trial run					
Pilot lot testing					
3 TOOLING					
Design	2000 —	14000 —			
Fixtures & Gages	7000 —	44000 —			
Molds					
Perishable tools		1000 —			
Tool revisions		18000 —			
Vendors tooling		6000 —			
4 SPECIAL MACHINES					
Construction	100 000 —				
Design					
Tooling					
Perishable tooling					
Operations					
5 [illegible] MACHINES					
Construction					
Design					
Tooling					
Perishable tooling					
Operations					
6 STANDARD MACHINES & TOOLS					
PRODUCTION AIDS					
Construction					
Operations					
7 [illegible]					
Machine alterations					
Pilot lot mfg.		4000 —			
Machine [illegible]		1000 —			
Comp. obsolescence					
Provision for advancing					
wages & material costs					
-- [illegible]					
-- Plant	10900 —	8700 —			
TOTAL	119900 —	95700 —			
GRAND TOTAL	215 600 —				

AL 0016446

ESTIMATE

Title: [illegible] LOCK REVISIONS
Date: [illegible]
Estimated by: [illegible]

Copies to: G.E. Fletcher, E. Burdick, [illegible], [illegible], E. Bryant, G. Campbell, [illegible], [illegible], [illegible], [illegible], W. Cook, [illegible], [illegible] Wall, H. Doyle

ALL FIGURES IN $	CAP.	OPER.			
1 DEVELOPMENT					
Investigation					
Design					
Model Making					
Design testing					
Models, for test					
Development - Powder Metal					
Development - Molds					
[illegible]					
2 PRODUCT ENGINEERING					
Process eng. & trial run					
Pilot lot testing					
3 TOOLING					
Design	1000	2000			
Fixtures & Gages	1000				
Molds					
Perishable tools		1000			
Tool revisions		58000			
Vendors tooling		5000			
4 SPECIAL MACHINES					
Construction	212000				
Design	12000				
Tooling					
Perishable tooling					
Operations					
5 PRODUCTION MACHINES					
Construction					
Design					
Tooling					
Perishable tooling					
Operations					
6 STANDARD MACHINES & EQUIP.					
7 PRODUCTION AIDS					
Construction					
Operations					
8 PILOT OPERATIONS					
Machine alterations					
Pilot lot mfg.		3000			
Machine rearrangement		2000			
Comp. obsolescence		3000			
Provision for advancing					
wages & material costs					
-- [illegible]					
-- Plant	23000	8000			
TOTAL	249000	83000			
GRAND TOTAL	332000				

John M.

3-22-80

M1700 # Bolt Action Carbine Estimate

Bolt Assembly
Bolt Handle — SK-C-3550
Detent Plunger — SK-B-3549
" Spring — —
" Ret. Pin — —
Bolt Body — SK-D-3551
Firing Pin Assy
Final Assembly

Gary,

This is the estimate for the Bolt Lock - the drawings we used were for the M/700, but are more sequential in case this in the Bolt Action Carbine estimate.

[illegible] 7/24/80

John —
Work this up & issue to IE for estimate on its own.
They can add to BAC as separate item.

Thanks
GC

M700 Bar-Latch Mechanism
Cost Breakdown

T R Andrews
2/10/80

Standard Material	$ .43	25	(Estimated)
Material Variance	.05	03	(@ 13.3% - historical ratio)
Standard Labor	.82	60	(Estimated)
Labor Variance	.25	18	(30.6% - calculated by department based on 1979 experience)
Direct Charges	.20	30	(Estimated)
Industrial Relations	.63	40	(@ 47.9% of Labor + Labor Variance)
Other Direct Expense	.08	07	(Calculated based on historical setup repair and gas & power ratios)
Additional Depreciation	.13	14	(@ 7.5% of project estimate)
Other Manufacturing Overhead	.23	24	(Calculated based on historical ratios)
Sub Total	2.55	2.63	
Plant Overhead	.45	10	(@ 17.5% of subtotal - historical ratio)
Total Cost	$3.00	2.67	
	2.62		
	-3%		

AL 0016449

M/700 Bolt Latch Mechanism
Cost by Component

T. R. Andrews
12/17/80

Component	Standard Material	Standard Labor	Direct Charges
Bolt Latch (new part, 2 drill press operations heat treat & color)	$ .168	$ .115	$ .028
Bolt Plug (existing part + 3 special machine operations & deburr)	—	.377	.169
Bolt Assembly (existing part + 1 mill oper.) [illegible]	—	.053	.101
Firing Pin Assembly (existing part + assem. oper.)	—	.092	.0001
Detent Plunger (new part heat treat & color)	.234 .056 .178	.0004	.0004
Detent Plunger Spring (new part)	.013	—	—
Detent Retaining Pin (new part)	.011	—	—
Final Assembly (added inspection element)	—	.014	—
Total	$ .426 - .178 .248	$ .6514	$ .2985

AL 0016450

(Bolt Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL 5AR BINE (Bolt Action) COMPONENT FINAL ASSEMBLY PART NO. —

DATE 5-28-82 COMPUTER KOWALSKI SHEET 1 OF 1

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	NOTE: SAME AS PROPOSED ESTIMATE FOR BOLT ACTION CARBINE DATED 4-12-80 PLUS THE FOLLOWING OPERATION CHANGE				
197	ASSEMBLE ACTION				
	14 - TRY SAFETY -				
	— ADD - CHECK BOLT LOCK -				
	CLOSE BOLT - LOCK DOWN -				
	MUST STAY IN LOCK				
	POSITION - RELEASE				
	BOLT LATCH TO OPEN				
	BOLT -				
	CLOSE BOLT - LOCK DOWN				
	FIRE - BOLT LATCH				
	MUST OPEN -				
	TOTAL				

AL 0016451

RD-6568 1-15-63

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

• SEQUENCE OF OPERATIONS •

MODEL AZ-3NE COMPONENT FIRING PJ ASSEMBLY PART NO. —

DATE 5-24-73 COMPUTER KOWALSKI SHEET 1 OF 1

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	NOTE				
	SAME AS PRESENT 41600 FIRING PJ				
	ASSEMBLY * 28600 PROCESS				
	EXCEPT FOR THE ADDITIONAL OPERATION				
25	INSERT DETENT PLUNGER	BENCH			
	SPRING, DETENT PLUNGER				
	WITH BOLT LATCH TO	ASSEMBLY FIXTURE	VEW	30	60
	BOLT PULL & PIN (.203 PIN)				
	NOTE: TRY BOLT LATCH				
	FOR FREEDOM				
	TO DEBURR AREA				
	TOTAL				

AL 0016452

RD-6566 1-18-63

67 of 80

(Bolt Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

• SEQUENCE OF OPERATIONS •

MODEL MACHINE COMPONENT Detent Plunger Spring PART NO. —

DATE 3-14-83 COMPUTER KOWALSKI SHEET 1 OF 1

OPER NO	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	PURCHASE FROM SPRING VENDOR				
	EST PIECE PRICE - $1.\frac{5}{2}$ M				
	PURCHASING INSPECTION	BENCH			
	TO DISTRIBUTION AREA				
	TOTAL				

RD-6568 1-18-83

AL 0016453

Bolt Lock

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL 4173 Boy Action COMPONENT Detent Plunger Retaining Pin PART NO. —

DATE 3-12-81 COMPUTER Kowalski SHEET 1 OF 1

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	PURCHASE DRIVE-LOCK TUBE 1/16 x 3/8"	B			
		COST: - 8.6¢ M			
	5/8				
	PURCHASE INSPECTION	MISC STK		—	—
	TO DISPATCH AREA				
	TOTAL				

AL 0016454

RD-4568 1-18-63

(Bolt Lock / Special Machines)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

• SEQUENCE OF OPERATIONS •

MODEL 700 COMPONENT Bolt Plug PART NO. SKD-3002

DATE 9-23-93 COMPUTER Nowalski SHEET 1 OF 2

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	Purchase Screw Machine Blank From Vendor				
	Est	Pr/Peice - .58¢ Each			
		Tooling $150.00			
	Fireless Inspection	Gages STD	AU	—	—
		Cond. Screen	USU	5	—
12	Mill Firing Pin Head Slot 2 Flats on Bottom	Same as Present M/700 PT# 17012			
15	Mill Firing Pin Head Slot 2 Flats on Bottom and Safety Clearance	Same as Present M/600 PT# 15876 Not Required on M/700			
22	Hand Ream Firing Pin Head Hole to Remove Burrs in Slot & Burr Both Sides of Firing Pin Head Slot	Same as Present M/700 PT# 17012			
(NEW) 25.5	Butt. Spot - Drill - Ream Retaining Pin Hole	6 Sta - Spec Machine Index Type			
	Gross 100 Parts/Hour	Machine (Cole)	NEW	X 000	52 000
	Delivery: 30-34 WKS	(Fixture Holders) (Cutting Tools etc)			
		Gages	NEW	25	45
	TOTAL				

AL 0016455

RD-4568 1-18-63

(BOLT LOCK - SPECIAL MACHINES)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

• SEQUENCE OF OPERATIONS •

MODEL 790 COMPONENT BOLT PLUG PART NO. SK D-3004

DATE 9-26-80 COMPUTER KOWALSKI SHEET 2 OF 2

OPER NO.	OPERATION NAME	MACHINE	DEPT. NO.	HOURS DESIGN	HOURS BUILD
(NEW) 25-8	LOAD & UNLOAD	6 STA. SPEC. MACHINE			
	DRILL STARTING HOLE - 1ST POS	INDEX TYPE			
	BUTT DRILL " " - 2ND "			3	
	DRILL " " 2ND "	MACHINE	NEW	—	120,000
	ROUGH MILL SLOT (2 DEPTH)	(FIX - HOLDERS - CUTTING TOOLS)			
	FINISH MILL SLOT (2 DEPTH)	GAGES		70	200
	MACHINE CYCLE - 36 SEC (APPROX)				
	DELIVERY - 30-34 WKS				
(NEW) 26	BUTT - DRILL TO DEPTH	REM. STD. LINE MACHINE			
	DETENT PLUNGER HOLE				
		MACHINE		4000	20,000
	MACHINE CYCLE - 40 SEC (APPROX)				
		FIXTURE	NEW	50	1000
	DELIVERY - 30-34 WKS	TOOLS	STD NEW	2	$15
	(APPROX)	GAGES	NEW	40	110
27-X	DEBURR	BENCH			
29	SUPERSHEEN	SAME AS M1790			
31	DEGREASE	" " "			
32	NITRE BLACK & PLACE IN TRAYS	" " "			
34	INSPECT FOR COLOR				
	TO SUB-ASSEMBLY				
	TOTAL				

RD-6568 1-18-63

AL 0016456

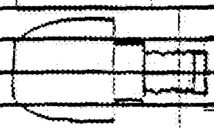
(BOLT LOCK)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL M/700 & Bolt Action Marine COMPONENT Bolt Plug PART NO. SK-D-3551

DATE 5-27-8? COMPUTER Kowalski SHEET 1 OF 3

OPER. NO.	OPERATION NAME	MACHINE	DEPT. NO.	HOURS DESIGN	HOURS BUILD
	Purchase Screw Machine Blank				
	From Vendor.				
		Est. P/Price - .58¢ each			
		Est. Tooling - $150.00			
	Purchase Inspection	Gage	Std AU	—	—
		Comp Screw	New	9	—
12	Mill Firing Pin Head Slot	Same as present M1700			
	2 Flats on Bottom	op 17012			
(NEW) 15	Mill Flat on Side	O.? Miller op	Ex.10		
			75		
		Fixture	New	25	135
		Cutter		5	$100.00
		Arbor	Std	—	—
		Gage	New	40	120
24	Hand Ream Firing Pin Head	Same as present			
	Hole to Remove Burr	M1700 pt # 17012			
	in Slot & Burr Both Sides				
	of Firing Pin Head Slot				
	TOTAL				

AL 0016457

RD-6368 1-18-63

(Bolt Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL M/700 & Bolt Action Carbine COMPONENT Bolt Plug PART NO. SK-D 3551

DATE 5/27-80 COMPUTER Kowalski SHEET 2 OF 3

OPER. NO.	OPERATION NAME	MACHINE	DEPT. NO.	HOURS DESIGN	HOURS BUILD
(New) 25	Load & Unload	7 Sta Spec Machine - Index Type			
	Mill Front End of Bolt Latch Slot				
	Profile Rear End " " "	Machine Cost	New		100,000
	Drill 1st Starting Hole	Fixture (Trees)	"	70	$ 7 000
	" 2nd " "	Perishable Tools	"	6	$ 525
	Mill Small Slot	Tool Holders	"	20	$ 750
	Mill Form in Center Section	Gages	"	190	550
	Cycle Time - 45 Sec (Assume)				
(New) 26	Butt & Drill to Depth Detent Plunger Hole	2 Spdle Drill Press			
		Drill Jig	New	60	120
		Tools	Std	2	$ 15
		Gages	"	40	110
(New) 27	Butt Spot Drill - Ream Retaining Pin Hole	4 Spdle Drill Press			
		Drill Jig	New	60	120
		Tools	Std "	6	$ 25
		Gages	"	35	95
(New) 27.5	Deburr	Bench			
28	Sudberized	(Same as M/700)			
	TOTAL				

AL 0016458

RC-656B 1-18-63

(Bat Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL Passive COMPONENT Bat Plug PART NO. SK-D-3551

DATE 5/27-93 COMPUTER KOWALSKI SHEET 2 OF 3

OPER. NO.	OPERATION NAME	MACHINE	DEPT. NO.	HOURS DESIGN	HOURS BUILD
21	Degrease	Same as M1700			
22	Under Black Paint in Tanks	" " "			
23	Inspect for Defects	" " "			
	To Sub-Assembly				
	TOTAL				

AL 0016459

RD-6568 1-18-63

BOLT LOCK - POWDER METAL

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

* SEQUENCE OF OPERATIONS *

MODEL 100 COMPONENT BOLT LATCH PART NO. SK-C-3205

DATE 12-DEC COMPUTER KOWALSKI SHEET 1 OF 1

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	PURCHASE FROM HI-DENSE DIVISION				
	POWDER METAL BLANK				
	QUOTATION # 1-1525				113-13-401
	153.5/M - 25 000 QTY				
	$143.9/M - 50 000 "				
	TOOLING 4400.00				
20	DRILL CROSS PIN HOLE	1 SPINDLE DRILL PRESS			
		DRILL JIG	NDEW	40	120
		F52 (.3685 DIA) DRILL	150	—	—
		GAGES	NDEW	21	45
30	COUNTER BORE HOLE (FROM SIDE)	1 SPINDLE DRILL PRESS			
		C'SINK	370	—	320
40	CLEANING (HARDEN)				
50	LINDBERG DEW				
60	INSPECT FOR HARDNESS				
70	BLACK OXIDE COAT				
	TO MRP CRIB. TOTAL				

AL 0016460

RD-6568 1-18-63

(Bolt Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

• SEQUENCE OF OPERATIONS •

MODEL M-28 & Bolt Action) COMPONENT Bolt Latch PART NO SK-C-3550

DATE 5-23-80 COMPUTER Kowalski SHEET 1 OF 1

OPER NO	OPERATION NAME	MACHINE	DEPT NO	HOURS DESIGN	HOURS BUILD
	Purchase Investment Casting from Vendor				
	50 - Pieces - 1.10 EA				
	Est Tooling - $4200.00				
	Purchase Inspection	Bench			
		Comparator Stand	NEW	10	—
		Fixture	STD	—	—
		Gages	STD	—	—
10	Drill Cross Pin Hole	Indexing Drill Press			
		Drill Jig	NEW	40	90
	.52 Drill	Drill .52 (.0033)	STD	—	—
		Gages	NEW	25	1.05
20	Deburr	Bench			
30	Buff - Top	Polishing Jack			
40	Carbide Harden				
50	Lapping & Draw				
60	Inspect for Roundness				
70	Black Oxide				
	To Dispatch Area TOTAL				

RD-6568 1-18-63

AL 0016461

(Bolt Lock)

PROCESS ENGINEERING ESTIMATE - TRIAL AND PILOT SHEET

(1700 Ser - Action)

• SEQUENCE OF OPERATIONS •

MODEL 1700 SERIES COMPONENT Detent Plunger Spring PART NO. —

DATE 5-[illegible]-70 COMPUTER KOWALSKI SHEET 1 OF 1

OPER NO.	OPERATION NAME	MACHINE	DEPT NO.	HOURS DESIGN	HOURS BUILD
	PURCHASE FROM SPRING VENDOR				
	EST PURPRICE - 11¢ EA				
	PURCHASING INSPECTION	BENCH			
	TO DEPT # 4660				
	TOTAL				

RD-6358 [illegible]-63

AL 0016462

ALEKSICH

Tool Chg 17012 } 11.957 labor } 69.357
57.400 material
129.855 full factory

Rev Acct
4/15/81

AL 0016463

78 of 80

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE

Remington DUPONT PETERS DUPONT

"CONFINE YOUR LETTER TO ONE SUBJECT ONLY"

Xc: C. B. Workman
T. L. Capeletti

February 8, 1982

TO: J. S. Martin

FROM: F. E. Martin

SUBJECT: M/700 Fire Control Program

The program to complete this project beginning now could be completed by 1 September 1982:

- The completion of the testing of fire controls already in the Test Lab. These fire controls contain:
  - hardened triggers
  - trigger block plunger of 8640 material
- Fabrication and testing of fire controls having:
  - skeletonized housing
  - relieved sear
  - relieved triggers - design permitting
  - no trigger connector
- Research-Marketing agreement on implementation of change
- Design acceptance and transmittal

FEM:ws

AL 0016464

G-88

DON'T SAY IT—*WRITE IT*

cc Fred Martin

To Jim Martin

From Tami C ✓

Date 2/16/82

E-12

re: M/200 Fire Control Program

We should schedule an early review of our plans with Warehouse, Marketing, and Legal (+ Production ?) to make sure they are aware of our direction for this design. To be completed by Sept. 1, 1982 means that we must have a specific design concept in mind by March 1st with at least one contingency. Therefore, we should be prepared to review by mid-March.

"SAFETY RULES ARE PERFECT TOOLS"

AL 0016465