

RESEARCH DEPARTMENT

FIREARMS RESEARCH DIVISION

MONTHLY REPORT - JUNE 1980

*Remington Arms Company, Inc.*

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HIGHLIGHTS

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• Two solutions to the Model 870 Competition Trap Shotgun locking block problem have been satisfactorily tested. Buffered pistons are being tested as a possible solution for rib failure.	1
• Model 7600 machine trial test results show a malfunction rate of .09% in 1140 rounds of field cycle testing.	2
• The Model XSG Shotgun is ready to resume testing with a new lower stressed action spring and a modified Model 1100 gas system.	2
• The inertia retract firing pin for the Seismic gun has been selected for production due to a more favorable misfire rate.	3
• An accepted Model 700 bolt lock design is being assembled and will be tested on the bolt action carbine.	3
• Regular size rivetless extractors are currently being assembled in Model 700 - 7mm-08, Model XP-100 7mm BR, and Model 7400-7600 pilot run and production rifles.	5
• Integral ejectors for the Model 1100 - 12 Gauge Trial & Pilot barrels have been satisfactorily tested and are in full production.	6
• Updated ASEA Manipulator project economics show a \$70M per year savings at a 26% ROI. These figures include expenditures of \$6500 for a Schaevitz LVDT receiver repositioning system.	6

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| • Metallurgically sound laser welds of the 1018 slide blocks were obtained by EDL. Welding tests of the powder metal and 8620 slide blocks are in progress. | 6           |
| • Laser wood carving artwork for the Model 1100 LT-20 Ducks Unlimited gun and other designs are ready for review.   | 7           |
| • Auto-Drill line startups can be scheduled for late July. First will be the chip and filtration system and then the machining line.                        | 7           |

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Model 870 Competition Trap Shotgun

The Competition Trap Shotgun is a special, single shot version of the Model 870 with a gas operated recoil reduction system added. It was previewed at the Grand American Handicap Trap Shoot last August and announced in December of 1979.

Two standard locking blocks that were barrel shotpeened and two of a new design with increased cross sectional area below the locking notch have been endurance tested to 25,000 rounds without any cracks. Testing is in progress on a standard locking block that has directed shotpeening in the notch area. It has 10,000 rounds on it to date. Further testing is scheduled.

Vent ribs continue to break and posts come loose. Decreasing the bore diameter from an overbore to the standard bore did not reduce the problem. Investigation of the brazing process indicates good production manufacturing control. Strain gauge measurements of the vent rib during shooting have been started. Competition Trap barrels with the present piston recoil system have been compared with the Model 1100 barrel and its recoil system. Initial results indicate over twice as much strain on the Competition Trap vent rib as on the Model 1100 vent rib when the recoil system returns to battery. A piston with a buffer will be tested to see how much the stress level can be reduced on the Competition Trap barrel.

Work is being done on dry cycle equipment to simulate the stress level encountered when the piston returns to battery. Endurance testing with this device should reduce overall testing time and the number of live rounds required.

Two systems are being evaluated to retain the barrel in the receiver. One system uses the standard Model 870 magazine cap and guide ring fastened to the barrel ahead of the gas cylinder. This system works satisfactorily. The second system uses a positive locking detent system mounted on the barrel retaining sleeve. A model of this system will be tested.

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Prints of all the above designs have been furnished to Process Engineering for their evaluation and cost review.

Model 7400 Autoloading and Model 7600 Slide Action Centerfire Rifles

These rifles have been developed as replacements for the current Model 742 and Model 760 and are scheduled for announcement in December 1980.

Five Model 7400 - Cal. 30-06 rifles have been fitted with production heavy wall magazine boxes. The testing shows a reduction of about 1% in the malfunction rate, or from 3.5% to 2.5%. Work is continuing to reduce the stem override (SOR) malfunction which occurs on the last round out of the box. The trapped shell malfunction has been reduced by changing the configuration on the face of the ejector. If this proves successful in additional sample guns, the change will be transmitted to the Plant. The change is minimal and should have no detrimental effect on the project.

The wood processes have been resolved. Approval has been given for the Model 7400-7600 stocks and fore ends, and we have also approved the Model Four fore end. We have not had satisfactory samples of the Model Four stocks. The press form process has been approved except for the checkering.

Production firing pins, shot peened by Metal Improvements, have been dry cycled over 10,000 cycles and are satisfactory.

Model XSG, XPG Shotgun

New autoloading and slide action shotguns are being developed. The objective of the program is to replace the Model 1100 autoloading shotgun and the Model 870 slide action shotgun with improved versions which will be lighter in weight. The guns are being design simultaneously to take advantage of common parts for reduced manufacturing costs.

Four prototype guns have been used in the development and testing of this improved autoloader. A total of 45,000 rounds has been fired by the four guns and weaknesses have been uncovered in the locking system and action bar, slide block assemblies.

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Two new locking systems are currently being built. Barrel assemblies are completed for these locking systems and breech bolts; locking blocks and slide blocks are in the Model Shop.

Preliminary testing of one previous XSG model updated with new action bar assembly and longer round wire action spring has begun. This will enable us to monitor spring set as compared to previous spring design. A square wire action spring is on order from Connecticut Spring with delivery expected in July.

A gas cutoff system has been made and will be tested in a Model 1100 to determine its effectiveness in controlling bolt velocities between light and heavy loads.

#### 21mm Seismic System

A 21mm (8 Gauge) cartridge and gun system is being developed for MAPCO which is to be used for seismic exploration for oil and gas. An electric primer is being developed at Bridgeport and the firing system is being developed by Ilion.

Since the last report two types of retractable firing pins have been designed and tested. These include an inertia retract model and a cam operated automatic retract model.

The testing has been confined to live firing and firing primed empty cases. The inertia retract model has fired 7898 rounds and has experienced 73 misfires. The automatic retract model has fired 5255 rounds experiencing a total of 159 misfires.

Because of the more favorable misfire ratio the inertia retract model has been selected for production.

#### Model 700 Bolt Lock

The objective of this development is to give the shooter the ability to open and unload his firearm with the safety in the On position. In order to do this, the operation of the bolt lock and the safety have been designed to operate independently of each other.

An aesthetically acceptable lever has been designed and will be tested in conjunction with the bolt action carbine. Final cost estimates are being prepared by Industrial Engineering.

Testing is planned to start the first week in July.

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Model 700 Fire Control

A new fire control for the Model 700 bolt action centerfire rifle is being developed as part of an ongoing program to improve the functional characteristics of our current firearms line.

New components for the original (No. 1) design have been fabricated, assembled and are ready for test.

A third design which combines features of the original design and design No. 2 with the present Model 700 fire control is being assembled for evaluation.

Design No. 2 has tolerance problems. Development work is proceeding to resolve the problems.

Bolt Action Carbine

The carbine is a short barreled, bolt action, centerfire rifle that is under development as a replacement for the discontinued Model 600.

Five models are being assembled with a new bolt lock and powder metal latches for the floor plate. They will be function tested with one gun continuing on for endurance testing.

Accuracy tests on prototype models in all calibers gave averages below 2.7 inches for three 5-shot groups.

Seventeen (17) rifles in 7mm-08 caliber have been assembled, tested, and sent to personnel designated by Marketing for field testing.

A model with a M700 barrel contour has been prepared and shown to Marketing. They have requested that this contour be used on the final design.

Preliminary cost estimates have been discussed with Marketing. They have requested Research to look at alternate design to reduce

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costs if possible. Eleven items are being reviewed with Process Engineering and Industrial Engineering.

Rivetless Extractors

These new centerfire extractors in small, regular and magnum sizes will replace the troublesome riveted types. Part cost will be reduced, a number of bolt head operations eliminated, and gun reliability and ease of replacement will be improved.

All three extractor sizes have been extensively tested and approved for introduction in all centerfire rifles.

Drawings of extractors and bolt head modifications have been transmitted to Production.

Regular and magnum extractors require an anti-rotation projection in their respective bolt heads in order to prevent them from rotating out of position.

Tooling to coin the anti-rotation projections is being developed for all centerfire bolt heads in both right and left hand configurations. Tooling for the Model 700 Reg.Cal. and Model 7400-7600 bolt heads is complete and in production.



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Integral Ejectors

Currently the ejectors in the Model 1100 12 Ga. and 20 Ga. shotguns are spot welded to the barrel extension and machined to size. A process has been developed to form the ejector as an integral part of the barrel extension. Three operations will be eliminated as well as the ejector pin and result in a more durable ejection system. Tooling to coin ejection surfaces into 12 Ga., 16 Ga. and standard 20 Ga. barrels has been developed and transmitted to Production. Savings of over \$60,000 per year can be realized by this procedure.

Tooling modifications have been made to support the outside of the LT-20 barrel in order to reduce a "bulge" in the area of the ejector. This produced satisfactory results. Four prototype barrels have been sent to the Test Lab.

PROCESS DEVELOPMENTASEA Manipulator

Rifle and shotgun receivers are rough and finish polished by a labor intensive hand process. ASEA, Inc., an industrial manipulator manufacturer, demonstrated the technical capability of automatically polishing Model 742 and Model 760 receivers utilizing their industrial robot. Updated economics project a \$70M per year savings at a 26% ROI. These figures reflect the additional expenditure of \$6500 for the Schaevitz LVDT repositioning system to overcome the tolerance problem in receiver panel polishing. The vendor was visited to review the system design and timing. Delivery is anticipated in September 1980.

Laser Welding

Model 1100 and Model 870 shotgun slide blocks are currently being brazed to action bars or slide plates. The brazed joints are inherently unreliable and difficult to inspect without destructive testing. Scrap rates run as high as 20% in subsequent operations. A laser welding process was proposed to replace the troublesome brazing operation. The estimated gross savings are \$30M per year at a 38% ROI.

Metallurgically sound welds of the 1018 slide blocks were obtained by ETL. Welding tests of the powder metal slide blocks and the 8620 slide blocks are in progress. Sample completion by ETL and subsequent functional testing at Ilion has been delayed until 6-30-80 due to laser start-up problems and vacation schedules.

Laser Wood Carving

Laser wood carvings offer improved aesthetics over the current pressed checkering method of stock and fore end decorating. Laser carving is comparable in detail to the traditional and expensive hand carving methods but at greatly reduced cost.

Marketing expressed interest in a laser engraved DU emblem for the LT-20 Ducks Unlimited Edition. Artwork is ready for review with the vendor.

Other designs were prepared to further investigate laser decorating potential. Artwork will be discussed with the vendor before an order for samples can be placed.

Auto-Drill Line

The present method of preparing shotgun barrel blanks for the swaging machines is difficult to control and requires an unacceptably high degree of technical and engineering support. A process has been developed to replace it utilizing proven machining methods and completely automatic part handling.

It appears now that the startups can be scheduled for the latter part of July. First will be the chip and filtration systems and then the machining line. The electrical and plumbing work is progressing. By next week the area should be ready for the next phase of millwright work. The smoke system specifications should be finalized this week so it can be ordered.

There could be some degree of inadequacy of machine lubrication, as furnished, over extended operation. A detailed study is currently in progress to determine potential modifications.

Currently quoted drill head deliveries could leave us with short supply around the first of 1981. Negotiations with the supplier are in progress to improve the situation. An alternate type drill will also be investigated.

OTHER

New Owner's Manual Format

Our present owner's manuals are written using words that are often technically slanted, making it difficult for the average person to read and understand. The new manuals are being written using a controlled language with the key principle being one word-one meaning.

Mechanical illustrations for the Model 700 instruction book are scheduled to be completed the week of July 15. The exploded view is being revised to show the trigger housing as an assembly rather than separate components. Instruction books are expected to be printed and ready for packaging the first week in August.

Marketing and Legal Departments have approved the draft of the Models 7400 - 7600 instruction books. Work is proceeding to complete the camera ready copies for proof printing, with a scheduled completion of July 7, 1980.