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REMINGTON ARMS COMPANY, INC.  
RESEARCH AND DEVELOPMENT - FIREARMS  
FOURTH QUARTER PROGRESS REPORT - 1981

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HIGHLIGHTS

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<u>New Product Development</u>	
● Shotguns - XSG (Autoloader) prototypes are complete and XPG (Pump Action) prototypes are nearing completion. Work is continuing on several contingency designs.	3
● Research work with Production to reduce M/7400 gallery rejects is near completion. All calibers have met a 5% average reject rate except the 7mm Exp. Rem. Research is progressing with the development of three new calibers.	3
● The Model Four Limited Edition design has been transmitted to Production.	4
● Model Four Carbine prototypes have been provided to Marketing for evaluation.	4
● Completion of a second Model 7 bolt action rifle prototype is expected in January.	4
● Function and accuracy testing of the Bolt Action Carbine has been completed for most calibers. All drawings except the stock and magazine follower have been transmitted to Production	4
<u>Current Product Development</u>	
● Artwork samples for the Model 870 Limited Edition are being reviewed.	5
● A maximum bolt to receiver clearance of .035 in. is required to keep the receiver stress at an acceptable level in the Model 870 Competition Trap.	5

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| ● Prototype 1982 Ducks Unlimited Commemorative and Trade guns have been delivered to Marketing for review. | 6           |
| ● Prototype upgraded Model 700's have been sent to Marketing for review.                                   | 6           |
| ● Model 552 receivers with deflectors attached by drive screws have been assembled and are awaiting test.  | 7           |

Process Development

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| ● The four-slide machine is being installed in the Research N/C area. Start up is expected in December. | 7 |
| ● The latest molded piston seal for M/1100 shotguns failed in test after 70 rounds.                     | 8 |
| ● Establishment of a pilot investment casting line in Research is being investigated.                   | 8 |
| ● A preliminary economic evaluation of form rolling shows a \$280M annual savings and a 46% ROI.        | 8 |

STATUS - NEW PRODUCT DEVELOPMENTXSG/XPG Shotguns

New autoloading (XSG) and slide action (XPG) shotguns are being developed as potential replacements for the M/1100's and M/870's, respectively. Objectives include decreased weight, increased reliability, and reduced manufacturing costs.

Fourteen prototype XSG's are complete and four prototype XPG's are near completion. These include a modified A3 locking system, a square wire action spring forward around the magazine tube, improvements to the fire control system (one-piece connector, improved trigger, and modified hammer), a barrel contour redesigned for weight reduction and strengthened in the chamber area, integral ejector, wide extractor, improved feed latch system, and simplified interceptor latch. Work is continuing on contingency designs for the locking, gas, feed, and fire control systems.

The current XSG design satisfies all of the major program objectives. However, due to the significant capital investment projected for implementing the design and concern about value of the added features, the design is being re-evaluated.

Model 7400 Autoloading and Model 7600 Slide Action Centerfire Rifles

These rifles were developed as replacements for the Model 742 and 760, respectively, and were introduced into the product line in 1981. The Plant experienced a variety of start-up problems which required Research support. Gallery reject rates have now achieved an acceptable level (approximately 5%), mainly by adjustments to extractors and magazine boxes.

Three new calibers (25-06 and 7mm-08) will be added to the product line in 1983 followed by the .223 in 1984. Eight guns in both 25-06 and 7mm-08 are in the Test Lab for evaluation. Ten .223's with a 5-shot magazine are to be completed by the end of the year.

Model Four Limited Edition

This is a follow-on to the Model 1100 Limited Edition. The objective is to offer a unique and handsome example of gun art to collectors and other discriminating customers. The design and artwork have been transmitted to Production.

Model Four and Six Carbines

Two Model Four Carbines, in 30-06 caliber, have been provided to Marketing for evaluation. Design and styling of the Model Six Carbines will parallel that of the Model Four's.

Model 7 Bolt Action

The objective of the Model 7 program is to design a premium bolt action rifle based on the Model 700 family. Major features incorporated into the Model 7 design include an octagonal receiver and barrel with a restyled stock design. A prototype short action .257 Roberts has been fabricated. Completion of a second model in a long action .35 Whalen caliber is expected in January.

Bolt Action Carbine

The Bolt Action Carbine is a short, lightweight centerfire rifle being developed to replace the Model 600 which was discontinued in 1979. It will be strategically placed within the Model 700 line.

Function testing and accuracy have been completed on all calibers except the 7mm-08 which is being retested with hand loads because of questionable accuracy using the factory 140 gr. load.

All drawings except those for the stock and magazine follower have been transmitted to Production. The stock is being completed on the computer to tie in with the master stock. Sample followers were not to dimensions and new parts will have to be obtained.

A new model, with the butt stock slimmed-down per Marketing's request, will be completed prior to the January Operations Committee meeting.

STATUS - CURRENT PRODUCT DEVELOPMENT

Model 870 Limited Edition

A special, high grade Model 870 shotgun has been proposed to commemorate the 75th anniversary of Remington's first slide-action shotgun, the Model 10, introduced in 1907. This will be a follow-on to the Model 1100 and Model Four Limited Editions offered in 1981 and 1982, respectively.

Research is reviewing etched plates, illustrating the proposed receiver artwork. These plates were received from the vendor (Newcut) in November. The remaining parts for a prototype gun are currently available.

Model 870 Competition Trap Shotgun

The Competition Trap is a version of the standard Model 870 which has been modified to include a gas operated recoil mechanism. Small cracks were discovered on some receivers used in the 1981 Grand American Trap Shoot.

Test results indicated that the strain on the receiver increased as the clearance between the bolt and receiver increased. Further testing indicated that a maximum clearance of .035" would keep the strain at an acceptable level. Additional guns will be endurance tested to verify these results.

1982 Model 870 and 1100 Ducks Unlimited Shotguns

1982 will be the second year of a four year program to furnish special guns to the Ducks Unlimited organization. Guns planned for 1982 are as follows:

- M/870 - 12 ga. 3" Magnum Commemorative Dinner Shotgun;
- M/870 - 12 ga. 3" Magnum (32" barrel) Trade Shotgun;
- M/1100 - 28 ga. Special Dinner Shotgun.

Prototype Commemorative and Trade guns have been delivered to Marketing for review. The Special has been delayed until January because of a change requested by Ducks Unlimited.

Model 700 Upgrade

The Model 700 centerfire is Remington's top-of-the-line bolt action rifle. To meet increasing competition, this model will be upgraded for 1983 introduction.

Machined, no-bind, followers have been tested in all calibers with favorable results. The .222 caliber has a spring related feeding problem which will be investigated.

Prototype assemblies have been provided to Marketing for review. A meeting has been scheduled for January 7 to further define model requirements.

Model 552

The Model 552 autoloading rimfire rifle has a deflector to divert powder gases, residue, and other debris blown rearward during the rapid bolt opening and spent cartridge ejection. This deflector is attached with two standard screws. However, the screws and deflector can be removed with no special tooling, thus exposing the shooter to a potential hazard from flying debris.

Replacement of the present screws with drive screws has been proposed. The drive screws would be considerably more difficult to remove than standard screws. Six receivers have had deflectors attached using drive screws, and are awaiting live round and pull testing.

STATUS - PROCESS DEVELOPMENTFour-Slide Machine

In April 1980, Project TI-121 was approved to purchase and install a four-slide machine for the manufacture of prototype stamped parts, and, dependent on contracts with outside vendors, the manufacture of precision formed stampings for Production.

The four-slide machine has been delivered and is being installed in the Research N/C Shop. Start-up is expected in December.

New drawings of the M/7400 and 7600 long magazine followers, the first parts to be manufactured with this machine, have been transmitted to satisfy MRP requirements. Other production parts, suitable for manufacture on the four-slide machine, are being investigated.

Torlon Piston Seal

A new stainless steel stamped piston and high temperature plastic piston seal are being investigated for autoloading shotguns. Implementation of this design into the Model 1100 will result in a \$100M annual savings. In addition to the cost improvement, a reduction in gas system corrosion is expected.

The latest molded piston seal failed in test after 70 rounds. It appears that the seal is breaking after it leaves the gas cylinder, at which time unlimited expansion can take place. To test this theory, a shroud will be added to the front of an action bar sleeve such that it will limit expansion of the piston seal.

Investment Casting

This manufacturing technique is used extensively in the manufacture of competitive firearms, most effectively by Ruger. Past reviews of Remington components have shown no economic advantage in using investment castings. This conclusion may be biased because Remington parts were originally designed to be machined while Ruger components were designed for investment casting. Ruger's success may also result from their in-house casting capability.

A list of equipment to establish a pilot investment casting line in Research has been made. Cost for the equipment and building space is being established.

Form Rolling

Form rolling is a deformation process, similar to thread rolling, which may be applicable to manufacturing symmetrical, basically cylindrical, parts such as firing pins.

Industrial Engineering has issued a preliminary evaluation, based on five parts (M/7400 firing pin, M/1100 firing pin, M/7400 ejector, M/1100 front trigger plate pin, and M/1100 rear trigger plate pin), which shows that a \$280M annual savings and a 46% ROI can be realized by successfully implementing form rolling technology. However, significant tool development and component redesign would be required.