

LIMITED DISTRIBUTION

REMINGTON ARMS COMPANY, INC.
RESEARCH AND DEVELOPMENT - FIREARMS
FIRST QUARTER PROGRESS REPORT - 1983
March 28, 1983

Distribution List

R. E. Fielitz	J. W. Brooks
W. H. Coleman, II	J. C. Hutton
R. L. Hall	C. Lall
<u>C. B. Workman</u>	J. S. Martin
T. L. Capeletti	C. E. Ritchie
J. W. Bower	R. L. Sassone

Remington Arms Company, Inc.

- 2 -

HIGHLIGHTS

<u>NEW PRODUCT DEVELOPMENT</u>	<u>Page</u>
• All the Marketing samples and transmittals for the Model 1100 Special Field have been completed.	5
• A sample for the Model 870 Special Field has been approved and a drawing package turned over to Process for estimating.	5
• Five (5) styling samples of the Model 870 Restyle have been completed and are under-going Marketing evaluation.	5
• Nine (9) styling samples have been completed and development testing continues on a new autoloading shotgun design to replace the Model 1100.	5
• Initial drawings have been received and are being evaluated on a 20 Gauge Parker shotgun.	6
• Model drawings have been turned over to Process Engineering for cost evaluation on revisions to the Slide and Carrier of the Model 870 Police Shotgun.	6
• One (1) prototype has been completed of the Model 700 <i>Lightweight</i> which has been proposed as a replacement for the Model 700 Classic.	7
• Model 7400 .223 Carbine prototypes and preliminary economics have been reviewed by Marketing. Primary emphasis is now being placed on development of a 10 shot box as well as completion of test guns.	8
<u>CURRENT PRODUCT DEVELOPMENT</u>	
• Point of Impact tests on the Model 870 Magnum shotgun were within Remington specifications.	8
• Prototypes of the XP-100 pistols in .223 and 7mm-08 caliber will be complete in April.	9

- 3 -

	<u>Page</u>
• Model 700 BDL .223 Rem. caliber production rifles are released to warehouse.	9
• The .222 caliber stamped no-bind magazine follower for the Model 700 ADL Restyle has been transmitted to Production.	9
• New Product Development Cost Estimates are being prepared for the Model 700 Classic in 250-3000 Savage and .338 Win. Magnum caliber.	10
• Model 870/1100 Waterfowl prototypes will be completed by May 1.	10
• Sample receivers for the Model 870 Limited Edition have been received.	10
• Model Seven Lightweight production is proceeding in .243, 6mm, and .222 caliber using a reformed heat treated trigger guard and altered trigger.	10
<p>Prototype parts made of thicker material will be tested in .308 caliber rifles by May 1.</p> <p>A reinforcing screw has been added to the stock.</p> <p>The .222 caliber stamped, no-bind follower design has been released to Production.</p> <p>The .223 caliber prototype rifles will be tested in May with Production followers and springs.</p>	

MATERIALS AND PROCESS DEVELOPMENT

• Development of an injection molded Model 700 magazine follower is progressing on schedule, with warehousing expected by August 1.	11
• A Purchase Requisition has been written for a four-spindle Bostomatic CNC machine to cut checker pressed wood.	12
• A contractual agreement with Rol-Flo Engineering is being requested for the development of tooling to totally form the S/G firing pin.	12

	<u>Page</u>
• EPL is preparing their report on the feasibility of automatically inspecting discrete components.	13
• A third production run of P/M pole pieces has been held because of poor magnetic properties as determined by the new test techniques.	13
• A modified 410 stainless steel has been developed with impressive wear resistant properties. In a related program, addition of less than 10% WC to HD-1000 and HD-2108 enhanced mechanical properties.	13

- 5 -

STATUS - NEW PRODUCT DEVELOPMENT (J. S. Martin)Model 1100 Special Field Shotgun (D. S. Findlay, T. P. Powers)

The Model 1100 Special was developed to offer the shooter a lighter weight (7½ lb.), faster pointing Model 1100, with a significant change in appearance to supplement the current Model 1100 line. Features include a 21" barrel, a slimmed down and shortened fore-end, English stock, cut checkering, medium gloss finish, and no roll marking.

Research has completed all of the Marketing samples and transmittals required. Trial and Pilot of this gun is proceeding satisfactorily.

Model 870 Special Field Shotgun (D. S. Findlay, T. P. Powers)

The Model 870 Special Field is being developed to complement the Model 1100 Special with the same appearance and performance features. (i.e., a 21" barrel, a slimmed down and shortened fore-end, an English stock, and cut checkering)

One (1) sample has been completed and approved by Marketing. A drawing package has been turned over to Process Engineering for estimating required Capital Investment and Factory Cost.

Model Eighty-Seven Pump Shotgun (D. S. Findlay, T. P. Powers)

The Model *Eighty-Seven* is being developed as an upgraded Model 870 with new styling and mechanical features for 1985 introduction. Mechanical changes include the use of the Model 1100 barrel (long extension), Model 1100 sight line, and new magazine cap retention system. Specifications include 12 Gauge only, 3" chamber only, medium gloss wood finish with cut checkering.

Five (5) styling samples depicting options for new stock, fore-end, rib, and receiver contours have been assembled. These are currently undergoing Marketing evaluation. When a decision has been reached, drawings and models for test will be initiated.

Model 111/871 Shotgun Development (D. S. Findlay, T. P. Powers)

A new autoloading and slide action shotgun is being developed as a

- 6 -

potential replacement for the Model 1100's and Model 870's, respectively. Objectives include decreased weight, increased reliability, and reduced manufacturing costs.

The design currently being developed involves the use of a new, patently novel locking system, (rocker arm), improved barrel contour, threaded in stainless steel magazine tube, orifice selector/choke tubes, and improved carrier latch system. Four (4) samples will be completed by April 30 for preliminary design testing. Nine (9) styling samples have been completed which depict options for stock and fore-end design, checkering pattern, and receiver/vent rib contours.

The projected minimum capital investment required to implement the 12 Gauge autoloading design into production is approximately \$3.5MM. That total includes approximately \$1MM each for implementation of a new locking system, a new receiver design, and cut checkering, plus \$500M in miscellaneous items. With successful implementation of Firearms Modernization programs now in development, that investment can be reduced to less than \$2MM.

A design alternative being considered includes the use of an aluminum receiver which would provide further weight reduction by approximately one pound compared to the current steel receiver design. Prototypes with aluminum receivers have performed satisfactorily for up to 10,000 Magnum rounds with no significant damage to the receiver.

Parker Double Barrel Shotgun (D. S. Findlay, T. P. Powers)

Reintroduction of the classic Parker side-by-side barrel shotgun is being considered. Arrangements are proceeding to complete one (1) VH Grade 12 Gauge Parker by May 1983.

A partial set of drawings from Jesse Briley on a 20 Gauge Parker has been received. These drawings are undergoing engineering evaluation. Once the remaining drawings of the package have been received, they will be sent out for cost estimating by Process Engineering.

Model 870 Police Shotgun (A. A. Hugick, T. G. Bauman)

By intentionally tripping the feed latch on the Model 870 shotgun,

- 7 -

a jam condition can be created which is difficult to clear without removal of the fire control. While no complaints have been received from the field, modifications have been considered which will prevent jamming under the above conditions. Proposed modifications include changes to the slide and carrier assemblies.

Preliminary tests have been successful using slides modified to include an additional shell latch and carriers modified to provide additional shell clearance. Three (3) modified Model 870 Riot endurance test shotguns have been turned over to the Research Test Lab for a 20,000 round endurance test. The test will include a 25 round test of the jam condition after every 1,000 rounds.

Marketing has expressed concern about the disassembly of the action. With the new design slide latch, the fire control must be removed in order to depress the slide latch to remove the action bar assembly. Revisions are being considered to both the slide latch and carrier to simplify the disassembly feature. Our goal is to make the disassembly no more difficult than the standard (field) Model 870. However, in order to correct the jam condition and still maintain our standard for malfunction rate, this may not be achievable.

Bolt Action Rifle Development

(F. E. Martin, T. G. Bauman)

Two (2) new rifles are included in the bolt action program, replacements for the Model 700 Classic and BDL, respectively. The replacement for the Classic will be designated the Model 700 *Lightweight* and is planned for 1985 introduction. While a designation has not yet been determined, the replacement for the BDL is currently scheduled for 1986 introduction. Both rifles will feature a stock designed by Bob Emmons and a lightweight barrel contour. The BDL replacement will include other distinctive styling changes, such as an octagonal receiver with integral scope mounts. Functional improvements to the BDL will include a rotary magazine box for more reliable feeding, fully enclosed claw type extractor for added strength, no bind-easy lift bolt for smoother action, receiver with heavier — integral recoil lug for added stability, a redundant safety switch, and a fully adjustable fire control that does not require removal from the stock.

- 8 -

One (1) new Model 700 *Lightweight* with the latest design specifications has been assembled for review with Marketing. Parts list and drawings have been completed with the exception of the stock which will be completed in June.

The second generation of the Model 700 BDL replacement is scheduled for review in mid-April. A new extractor has been designed and fabricated to add strength and appearance to the bolt face. Testing has been delayed due to Project priorities. The fourth model gun from Bob Emmons featuring metal work by Pete Grisell has been received and evaluated by Research and Marketing. Some features may be considered by the BDL Replacement.

Model 7400/7600 Centerfire Rifles (R. S. Murphy, A. R. Eddy)

The Model 7400 and 7600 rifles were developed as replacements for the Model 742 and 760, respectively, and were introduced in 1981. The 7400 .223 Carbine is being developed as a sporting version of that popular cartridge to augment this product line. As this new version is implemented into production, continued Research support will be necessary to assist in start-up.

Model guns illustrating the newest design options and preliminary economics for the .223 Carbine have been reviewed by Marketing. Agreement has been reached on the stock and fore-end design with the final barrel configuration yet to be determined. The stock and fore-end will reflect the present contour with a toned down finish and birch wood. Marketing feedback has shifted design emphasis from the 4 shot box to one with a ten-round capacity. Specifications for the preferred design at this point include a magazine release on the box and no bolt release. Preliminary layouts have been completed and final drawings for two (2) designs will be completed by June. Test rifles are being built to reflect the latest design options.

STATUS - CURRENT PRODUCT DEVELOPMENT (J. W. Brooks)

Model 870 Police Shotgun (T. J. Plunkett)

Marketing has requested a shotgun in 12 Gauge with a 3" Magnum, 18 inch, full choke barrel and Parkerized finish for addition to the line

- 9 -

in 1984.

Point of Impact testing with three (3) front sight designs was satisfactory. Marketing has selected a preferred design. Costs are being prepared for the complete shotgun.

Model XP-100 in .223 and 7mm-08 Caliber (T. J. Plunkett)

Marketing has requested the addition of the .223 and 7mm-08 hunting calibers be added to the XP-100 line for 1984.

The Custom Shop is building prototype barreled actions in .308, .223, and 7mm-08 caliber. They are using the Model Seven Lightweight barrel, which is required for these larger cartridges. Stocks are being modified to take the Model Seven Lightweight contour.

If satisfactory, these changes will become the new standard stock and barrel contour for the XP-100.

The .308 caliber prototypes will be complete by April 5. They will be used to test the strength of the stocks with this heavier caliber. Testing will be completed by April 22 and if satisfactory, the .223 and 7mm-08 calibers will be function and accuracy tested by early May.

If a new stock is required, a fiberglass stock can be purchased or the present stock can be redesigned. Purchasing will be contacted for cost and delivery time for fiberglass stocks.

Model 700 BDL in .223 Rem. Caliber (P. Nasypany)

The .223 Rem. caliber will be offered with the standard Model 700 BDL barrel contour in 1983.

Production samples performed satisfactorily in Trial and Pilot testing.

Model 700 ADL Restyle (P. Nasypany)

The Model 700 ADL Restyle rifle is an upgraded ADL version with improved wood and metal features.

Vendor samples of the .222 Rem. stamped, no-bind magazine follower with the smaller ridge radii performed as well as the current production cast magazine follower during function tests. The model drawing reflecting these samples has been transmitted.

- 10 -

Model 700 Classic in .338 Win. Mag. and 250-3000 Savage Calibers
(P. Nasypany)

Marketing is continuing their plan to offer a limited run each year of special calibers in the Model 700 Classic rifle. They are planning on introducing the .338 Win. Mag. and 250-3000 Savage in 1984.

The .338 Magnum caliber will require a new barrel blank, mandrels, and gauges. Process Engineering will estimate the cost to produce this caliber. A new Product Development Request is being prepared by Research.

Prototypes of the 250-3000 Savage, using a 10 in. twist barrel, will be completed in April. If accuracy testing is not satisfactory, new mandrels will be required and new models will be built. A new Product Development Request is being prepared by Research.

Model 870/1100 Waterfowl Shotguns in 12 Ga. (P. Nasypany)

Marketing has requested a special Waterfowl shotgun in 12 Gauge with 3" Magnum vent rib barrel that will have rust resistant and non-reflective surfaces. It will be introduced to the line in 1984.

Parts for prototypes, to Marketing's model requirements, will be started the end of March and will be ready by May 1st.

Model 870 Limited Edition (P. Nasypany)

This special high grade Model 870 12 Gauge shotgun will commemorate the 75th Anniversary of Remington's first slide action shotgun, the Model 10, introduced in 1907. This will be the third in the line of special Limited Edition models to be produced by Remington. Marketing will introduce this model in 1984.

A second set of samples have been received from the vendor, Fountain Plating. They are being reviewed by Research and will be given to Marketing for their evaluation in April.

Model Seven Lightweight Rifle (D. Bullis)

The Model Seven is a short, lightweight bolt action centerfire rifle, developed to replace the Model 600 discontinued in 1979.

When Trial and Pilot of this .308 caliber began, floor plate cover opening was encountered and several stocks cracked.

- 11 -

The rear tab on the trigger guard was bent in a positive direction and the part was heat treated. This change in shape allowed a positive upward pressure to be applied to the floor plate base and the heat treatment prevented the rear tab from bending or returning to its original position.

This eliminated all floor plate openings on the .243, 6mm, and .222 caliber rifle. The .308 and 7mm-08 still experienced an occasional opening. In 84 guns tested, there was a 7% floor plate cover opening condition. When the rifles were disassembled and reassembled, several of these would not repeat.

The floor plate base assembly and cover are presently made from .050 material. We are making assemblies from thicker material and will have parts tested by May 1st in .308 caliber rifles.

The trigger has been altered to allow for increased clearance between the trigger guard plate and the side of the trigger.

A reinforcing screw was added to the stock and 75 stocks were tested. During endurance testing, one of the stocks developed a small crack, at 500 rounds, behind the recoil lug on the inside surface. After 3000 rounds, the crack did not propagate to the outside surface of the stock. The rest of the stocks were satisfactory. All testing was done with .308 caliber rifles using cartridges with 175 grain and 200 grain bullets.

Testing of the latest .222 caliber stamped, no-bind followers in Model Seven and Model 700 rifles shows it is as good as and in some cases better than the current cast follower. The design has been released to Production. Production samples will be tested when received in May.

The .223 caliber prototype rifles will also be tested in May with the new Production stamped, no-bind follower and spring.

STATUS - MATERIALS AND PROCESS DEVELOPMENT

(J. W. Bower)

Injection Molding of Metal and Ceramic Components

(C. Lall
B. Panagian
K. C. Rowlands
M. Tasovac
M. J. Topolski)

This is a manufacturing technique for producing small, intricately shaped parts from metal or ceramic powders. The three-dimensional

- 12 -

injection molding process offers a promising complement to Remington's powder metal business. This improved geometric potential, plus improvements in physical and mechanical properties, should open up new markets to the Specialty Products Division.

Development of our injection molded Model 700 magazine follower is progressing. Warpage of the sintered part has been reduced significantly. Additional parts will be processed during the week of March 14. A revised cost estimate has been made. It verifies a very healthy reduction in factory cost over the present investment casting. Implementation of the follower into saleable guns is anticipated for August 1, 1983.

A revised Appropriation Request for ceramic molding equipment will be circulating by March 18.

Cut Checkering Machine Development (R. J. Balaska
A. M. Makowski
B. Panagian)

Remington's present N/C cut checkering machines will be completely burdened by the end of 1983. Marketing has identified several new specifications to be cut checkered, requiring the purchase of additional machines. This machine development program will provide additional checkering capacity at an appreciable reduction in machine cost.

A Purchase Requisition has been written for a four-spindle Bostomatic CNC machine to cut checker pressed wood. Machine completion is expected in July. Fixture design should be complete by April 1. Cutter development has begun.

Selection of a machine for sanded wood should be made in April.

Form-Rolling (E. R. Owens)

Form-rolling is a deformation process, similar to thread rolling, which may be applicable for small, solid, cylindrical parts. Initial development work was done with Rol-Flo Engineering, Inc., West Kingston, Rhode Island. The successful applications of form-rolling to make trigger plate pins, and burnish shotgun firing pins have been demonstrated.

With the deferment of the form-rolling Appropriation Request, Purchasing has been requested to assist us with a contractual agreement

- 13 -

with Rol-Flo Engineering for the development of tooling to totally form the Model 870/1100 firing pin.

Testing and Inspection

(J. A. Lawrence
B. Panagian
A. M. Makowski)

Increased emphasis on quality, plus the higher incidence of product liability claims, points towards 100% inspection of critical components. Further, the visual and functional inspections of finished products are very labor intensive, and largely subjective in nature. This broad Research program will provide systems to economically inspect critical components, and automate the gallery and final inspection functions.

EPL will present their findings on the feasibility of automatically inspecting discrete components, in Wilmington, on April 6.

Testing and Certification of Magnetic Powder Metal Components (C. Lall)

Magnetic pole pieces are used in matrix printers to form a character when an appropriate set of them are energized by signals from a computer. The speed of response and the impact force are very important variables. In order to verify that a part is magnetically correct, a procedure has been established for measuring these variables on actual parts from a production run.

A third production run of pole pieces has been held because of poor magnetic properties. Preliminary investigation indicates that there are no cracks in the parts, which suggest that pressing techniques have improved. The problem may lie with improper sintering and annealing. A new run will be made. Additional samples of different alloys will also be prepared for research purposes.

Work is continuing at the Experimental Station to improve the reproducibility of sintering Fe-Si magnetic alloys.

Wear Resistant Powder Metal Alloys (C. Lall
M. J. Topolski)

The aim of this project is to make wear resistant components by the powder metallurgy route. Several approaches are being followed.

- 14 -

410 stainless steel powder has been modified with additions of Mo, Ni, P, and C. A series of vacuum sintering experiments have produced the following results:

- transverse rupture stress - 130,000 psi
- hardness - R_c 48-52
- Shrinkage - .055 in/in

In a different application, various amounts of TiC and WC are added to Remington materials HD-1000 and HD-2108 to determine the effect on wear resistance. Initial testing indicates that the powders used were too fine. Additions of less than 10% WC were beneficial, but additions of TiC, at any level, deteriorated the mechanical properties.