

File

LIMITED DISTRIBUTION

REMINGTON ARMS COMPANY

NEW PRODUCTS RESEARCH

FOURTH QUARTER PROGRESS REPORT -- 1983

DECEMBER 21, 1983

14

Distribution

R. E. FIELITZ	P. A. LEWIS
W. H. COLEMAN, II	C. E. RITCHIE
C. B. WORKMAN	R. L. SASSONE
J. W. BOWER	L. R. SROKA
P. S. HEBERT	W. L. TOMER

REMINGTON ARMS COMPANY

NEW PRODUCTS RESEARCH

FOURTH QUARTER PROGRESS REPORT -- 1983

AMMUNITION HIGHLIGHTS

	<u>Page</u>
New Unibody 12 ga. 3" LV and 20 ga. 2-3/4" bodies are currently in Production. A Trial & Pilot run of 50,000 8 ga. bodies has been successfully processed through AH&P. Loading is scheduled the week of 12/19. Bodies for 12 ga. 2-3/4" and 28 ga. hand headed using a redesigned heading stem have passed all severe function & casualty tests. Machine demonstration is scheduled in January, 1984.	1
Hand assembled 12 ga. 3" large volume SP bodies are being evaluated as a back-up for the 3" large volume New Unibody. Satisfactory head pull and preliminary load fit and ballistics have been obtained. ARD confirmation is expected in January, 1984.	2
"Premier" Shotshell 12 ga. 3" 1-7/8 oz. and 20 ga. 2-3/4" 1-1/8 oz. loads have been held for high average room temperature pressures. Preliminary findings indicate it may be related to moisture content of the powder. A program is underway to confirm this assessment.	3
"Premier" Centerfire hand formed flat base bullets with a power curve ogive and CORE-LOKT [®] jacket gave acceptable ballistics, accuracy, and 50 yd. mush. Secant ogive (nearly equivalent to the power curve) tooling is being fabricated for demonstration on the bullet assembly machine in February, 1984.	5
The 6mm Recall product pressure excursions have been attributed to the powder.	6
An ABC Primer with four flash holes was tested with no battery cup distortion or failures. Tooling is being refined to increase the anvil point height.	7
The 357 Rem Max 180 SJHP Trial & Pilot has been successfully completed. A "Release to Ship" has been signed by ARD. Further work has been halted pending resolution of the hand gun manufacturers' potential decision not to produce this chambering.	7
The 38 SP +P 125 SJHP mush performance has been achieved using 0% Sb lead. A Trial & Pilot run is planned by Production in January, 1984.	8
The latest Centerfire Modernization proposal and economics were reviewed at the November Operations Meeting. This plan focused on modernized bullet jacket, assembly, and burnishing equipment for rifle products only. A construction project will be written and submitted for authorization in the first quarter of 1984.	8

REMINGTON ARMS COMPANY

NEW PRODUCTS RESEARCH

FOURTH QUARTER PROGRESS REPORT -- 1983

FIREARMS HIGHLIGHTS

	<u>Page</u>
<u>SHOTGUN DEVELOPMENT</u>	
• Tooling and part fabrication for the elastomer buffer fore-end design, for the Model 1100 Special Field 12 Gauge shotgun, is on schedule.	9
• Research has approved the Model 870 - 12 Gauge Special Field trial and pilot production guns.	9
• Drawings and parts list for the 12 Gauge Model 870 Restyle are ready for transmittal.	9
• Research testing of prototype Models 870 and 1100 Deer Guns will be complete in January.	9
• Research testing of prototype Models 870 and 1100 Waterfowl Guns is scheduled to be completed by the end of January.	10
• Testing of Briley choke tubes should be complete by February 15.	10
<u>RIFLE DEVELOPMENT</u>	
• Model 700 Mountain Rifle stocks are nearing completion. Accuracy testing will take two weeks.	10
• Work on the New Bolt Action model guns is progressing.	10
• Sportsman 74 and 76 drawing packages and parts lists are complete and awaiting approval to transmit.	11
• Research testing of production trial and pilot Model Sevens is expected in early February.	11
<u>CURRENT ARMS</u>	
• A new design for the 870 Riot gun called the flexi-tab has been initiated. Prototypes have been made and testing looks satisfactory. Nine guns are now in the Test Lab for fired and endurance evaluation.	11
• Design alterations to the Model 1100 are being considered to reduce the incidents of "Don't Lock Open" (DLO), with "Premier" 12 gauge 1-7/8 oz. loads.	12

REMINGTON ARMS COMPANY

NEW PRODUCTS RESEARCH

FOURTH QUARTER PROGRESS REPORT -- 1983

AMMUNITION

New Unibody Process

The New Unibody Shotshell Process is being developed to provide a single process for all shotshell gauges. It has been designed to substantially increase process tolerances and yield, and simultaneously improve product quality.

8 Gauge 3-1/4"

Final body former tool trim in was completed after corrections to the prehead striker rod assembly eliminated station-to-station bridge height variation. A 50,000 piece Trial & Pilot run was successfully completed on the body former and AH&P Trial & Pilot loading of 8 ga. magnum product is scheduled to be completed before year-end.

12 Gauge 3" Large Volume

Product has been successfully put in to Production. Some minor tool modifications may be required to correct a low frequency of internal body tears and head buckles. These items are not considered detrimental to product integrity but should be corrected at a later date as assignments permit.

12 Gauge 2-3/4"

A new heading stem to correct domed heads and primer set-back casualties has been successfully demonstrated in hand heading product. Three additional stems have been fabricated to confirm the design in one carrier of the #3 Triplex assemble, head and prime machine. Upon successful completion of testing a full set of stems will be ordered by Production. Testing will be conducted as schedules permit to avoid conflict with unibody production.

20 Gauge

Initial lot acceptance tests have been completed on the rifled slug load. Test results were favorable. However, Production instituted changes to the powder, wad and skive subsequent to their submission due to pressure variation and inconsistent crimp quality. ARD will retest when additional product is submitted.

Research Department

- 1 -

December 1983

20 ga. target has been transferred to Lonoke for implementation using the Rotary Cam body. ARD transmitted specification and gaging information to Lonoke for their use.

ARD has developed a preliminary hand load for the #3 buck. This information has been transmitted to Production.

The Simplex loader has been retooled to accept the 2-7/8" body. Acceptable load fit has been obtained for the 1-1/4 oz. "Premier" load. Product will be submitted for acceptance testing pending demonstration of acceptable ballistics, (see "Premier" for additional details).

28 Gauge

Testing on product headed at AH&P with redesigned heading stems revealed primer leakage under the cap. This resulted in a low frequency of complete head pull offs and major battery cup movement. The heading stem has since been redesigned to produce a collar around the primer. Preliminary testing of 600 hand headed rounds showed no signs of leakage around the primers or basewad cracks after storage at +150°F and -20°F. The addition of this collar has also resulted in an increase of about 10 pounds in the primer pushout force while maintaining head pulloff forces. Confirmation tests are in progress prior to modifying heading stems for the #4 Simplex AH&P machine.

.410 Bore

The initial tapered wall shell has been replaced with a straight wall shell because of its larger volume. However, "bananas" are more pronounced in the straight walled shell. This may be due in part to a bent extrusion punch. A new punch is currently being produced to see if this solves the problem.

Long term storage and function and casualty tests in non-standard guns are planned to check out the integrity of this body upon first firing. Up to six reloads have been achieved before buckling occurs which is less than Winchester.

12 Gauge 3" Large Volume SP Shell (RC 3" LV Back Up)

The 12 ga. 3" large volume SP shell is being developed as a back-up product for the large volume RC shell. It features a special thin wall body (.024") and a .250" thick HDPE plastic basewad. Unique heading tools form the plastic basewad with an obturating skirt for prevention of gas leaks at all test temperatures.

Thin wall bodies, plastic basewads and special heading tools have been made. The large volume SP product is being hand assembled on Semi-works equipment. Headpull results of the finished product are good (160 lbs. avq.) and preliminary load development (for load fit only) with the 1-7/9 oz. "Premier" magnum load appear satisfactory. Approximately 250 shells are now being assembled for more comprehensive product development tests with completion expected in early January, 1984.

"Premier" Shotshell

Competitive shotshell products with buffered and/or hard copper plated shot have acceptance among upland game and water-fowl hunters. Marketing has requested a similar line of products to maintain our competitive position.

12 Gauge 3" 1-7/8 Oz.

This load was put into Production in early November. Load fit, ballistics and crimp quality were acceptable using Hercules 259 Lot 11 powder. However, an audit of warehoused product in early December revealed room temperature pressures were approximately 2500 psi higher than at time of loading. Avg. pressures up to 13,200 psi were observed (SAAMI max. avg. is 13,000 psi). ARD confirmed these results in representative lots throughout November's production. Chemical Lab test on the powder from these lots showed moisture and volatile (M&V) content significantly lower than Hercules' original disposition and at time of loading (one sample only).

It appears the powder is susceptible to storage conditions which greatly effects ballistics. This was confirmed in ARD testing at various storage conditions. Chamber pressures varied from 7,500 to 12,700 psi when fired at room temperature dependent on the temperature/humidity exposure history. Four week 150°F storage results available in early December showed pressures reached 16,500 psi. SAAMI average proof pressures are 18,000 to 20,000 psi.

Hercules has reviewed these results and were genuinely concerned about the change in M&V. They are currently testing loaded rounds and an original sealed drum of powder. They expect to have preliminary results by December 20th. Disposition of the product in the warehouse is being withheld until all test results have been reviewed.

In addition to the ballistics problem the second lot of this powder (260 Lot 2) was found to exhibit much larger ballistics variation. ARD has established a 260/HM90 4/1 blend that appears to yield acceptable ballistics in handloads. Production's initial loading was also encouraging. Additional machine loaded samples are expected to be available December 19th.

12 Gauge 3" 1-5/8 Oz.

ARD has established a handload with confirmation at the process limits expected prior to shutdown. The experimental loading is scheduled for February, 1984.

20 Gauge 2-3/4" 1-1/8 Oz.

This load was put into Production in November, 1983. However, in a recent Production audit of warehoused product the average chamber pressures were found approximately 2,500 psi higher than at time of loading. This problem is being investigated in conjunction with the 12 ga. 1-7/8 oz. load. This product also uses Hercules powder (HM90 Lot 123).

20 Gauge 2-7/8" 1-1/4 Oz.

The experimental loading on the #3 Simplex is in progress. Initial load fit and crimp quality are good. The shell length is approximately .035" longer than the current specification to accommodate the load. This is well within SAAMI and the load fits current packaging.

Ballistics using the original powder (259 Lot 12) were slower than expected. HM90 is the next faster powder and will be evaluated the week of December 19th. Ballistics will be evaluated now and after storage over the holidays.

Steel Shot

Steel Shot is mandated in some waterfowl areas. Previously steel shot loads utilized a dry molded asbestos basewad. Asbestos use has been eliminated to avoid environmental contamination in the manufacturing operation. Development of loads in the New Unibody is requiring both new wads and load development.

12 Gauge 3" 1-3/8 Oz.

A handload has been confirmed at the process limits using the 3" LV RC body and 119 primer (standard for all 3" loads). The shot container has been demonstrated on Production equipment using a modified 1-1/8 oz. core pin. An experimental loading run will be scheduled in 1984 due to higher priority Production schedules.

Research Department

- 4 -

December 1983

12 Gauge 3" 1-1/4 Oz.

A preliminary handload has been established using the 3" LV RC body and 119 primer. Confirmation at the process limits is pending.

12 Gauge 2-3/4" 1-1/8 Oz.

A preliminary handload has been established using the 3" LV RC body trimmed to 2-3/4" length and the 116H primer (standard for all 2-3/4" field loads at Bridgeport). The shot container is currently in production. This load was developed due to difficulty in obtaining acceptable load fit with the standard 2-3/4" shell with a tapered wall.

Rifled Slugs

Hand load development and accuracy test for the experimental 3/4 oz. 20 ga. rifled slugs and 1-1/4 oz. 12 ga. rifled slugs with 116H primers passed Remington specifications. Slugs are available for experimental runs of both slugs. This will be scheduled as Plant loaders and Rotary Cam development schedules permit.

Shotshell Primer Basics

An extensive program has begun to demonstrate load compatibility of the #209 primers with 8 gauge magnums, 12 gauge buffered magnums, 20 gauge buffered magnums, and .410 bore magnums and target loads. This is expected to be completed in January, 1984.

Centerfire "Premier"

Competitive centerfire rifle products with superior ballistics, accuracy and cosmetics have gained acceptance among long range game hunters. Marketing has requested a similar line of products to maintain our market position.

The second iteration of .30 cal. bullet tooling has been sent out to vendors. This tooling will form secant ogive flat base .30 caliber bullets with an RT/R of .5" and a nose length of .665". The quantity RT/R is a nose shape parameter. It is the ratio of the tangent radius for the same nose length to the actual ogive radius. These tools, mainly bullet nose and knock-out punches, are scheduled for delivery by early February when they will be tested on hand equipment in Bridgeport before testing in the prototype bullet assembly machine at Lonoke.

Details of 200 yd. accuracy testing of four hand-formed bullet samples described in last month's progress report are listed below.

	Sierra 180 BT	Sierra 165 BT	Sample #1 181 BT	Sample #2 168 FB	Sample #3 138 FB	Sample #4 182 BT
Accuracy 200 yd-3/5's	2.6"	2.2"	5.0"	2.8"	2.5"	4.5"
Point Concentricity	.0004"	.0005"	.0010"	.0011"	.0012"	.0008"
Heel Concentricity	.0005"	.0007"	.0006"	.0011"	.0005"	.0004"

Accuracy for the flat base bullets was equivalent to Sierra. However, the boattail bullet accuracy was clearly inferior. The boattail samples were designed for minimum drag and may not be stabilized. Tools are being produced to hand form bullets with shorter boattails which will increase stability.

A mush test (gelatin) is now in progress with unannealed 185 gr. boattail samples at simulated 50 and 300 yd. (30'06) velocities. These samples have no lead exposed at the tip and the jackets have a CORE-LOKT® feature at the boattail bearing juncture. To date only the 50 yd. velocity has been tested. So far, no core separations have occurred. Weight retention and mush diameter have been comparable to control (180 gr. PSPCL).

Centerfire Primer Basics

Testing on the 22-250 Rem. to identify major sources of ballistics variation has been completed and is awaiting analysis. Further work will be conducted as priorities permit.

6mm Rem. Recall - IMR-7514 Powder

Testing of previously known "good" (S25I-D2605) and "bad" (S25I-D5631) product has been completed. Among other tests, the powder charges were exchanged between the two codes and S25I-D2605 tool on characteristics of the "bad" code. We have concluded that some problems with the propellant powder exist. Expro's powder blending facility used for this powder was suspected to produce powder that is inadequately homogenized. The equipment has been replaced with a superior process.

ABC Primer

The ABC (integral anvil) battery cup has the potential of significantly reducing costs through automation and improving quality through assured anvil positioning. In order to use the ABC battery cup in a target load primer, 1024 priming mixture must be used for breech flash elimination. However, the 1024 mix, currently used in target primers, increases the frequency of ABC battery cup casualties (blown bottoms). Three routes to improved performance are being explored: 1) increased flashhole area to reduce internal primer pressure; 2) elimination of a stress riser to improve battery cup integrity; and 3) development of a new priming mix to reduce internal pressure.

Samples of four hole battery cups have been made and tested with 1024 primer mix. Results to date have shown no battery cup failures and substantially reduced battery cup distortion. Current efforts are being directed at refining the experimental tools and increasing the anvil point height. Modified anvil pyramid dies have been received and tested but the expected increase in anvil height was not realized. It appears that it will probably be necessary to change the anvil draw progression slightly to accommodate the new anvil pyramid progression and increase the anvil height. Experimental fifth anvil draw tools are currently being tested in the machine.

Additional testing of the standard three hole ABC battery cup made with experimental tools which eliminated the stress riser at the base of the anvil shows that the elimination of the stress riser has a negligible effect on reducing battery cup casualties. Using a heavy charge of 1.24 gr. of 5074 mix, 400 battery cups with the stress riser had a 2.8% failure rate while 400 battery cups without the stress riser had a 2.0% failure rate.

357 Rem Max 180 SJHP

All work on the 180 gr. load has been completed. A Trial & Pilot run was made by Production and product tests were acceptable by Bridgeport R&D. Load development work remains to be completed for the 125 gr. load because of occasional high pressure rounds experienced using WC 295 powder. Another propellant, WC 680, appears to work well with the 125 gr. load but more extensive testing remains to be completed. Further work on the 125 gr. load, however, has been stopped because of allegations that Ruger and Dan Wesson may cease producing guns chambered for this cartridge.

Research Department

- 7 -

December 1932

38 SPL +P 125 SJSP

Originally intended for introduction in 1983, this load was not offered because of failure to mushroom when fired into gelatin. Mush performance comparable to Federal was achieved by changing the lead core from .75% Sb to 0% Sb. Tests of experimental run product have been satisfactory and the technical data package has been transmitted to Production for a Trial & Pilot run.

Centerfire Modernization

The rifle-only jacket draw/bullet assembly/bullet burnish construction project economics covered in the November Operations Meeting predicted an ROI and IRR of 27% and 20% respectively, based on increased sales of 9.1MM loaded rounds and component bullet. Five additional bullet assembly machines, two progressive draw jacket machines, and one bullet burnishing system are included in the \$1.9MM investment.

WHC:mf



Research Department

- 8 -

December 1983

STATUS - SHOTGUN DEVELOPMENT (D. S. Findlay)

Model 1100 Special Field Shotgun (T. P. Powers)

The Model 1100 Special Field was developed to offer the shooter a lighter weight, faster pointing Model 1100, with a significant change in appearance to supplement the 1100 line. Features include a 21" barrel, a slimmed down and shortened fore-end, English-style stock, medium gloss finish, and cut checkering.

Tooling and part fabrication for the elastomer buffer fore-end design is on schedule. Trial and pilot samples should be available in January, with product expected to go to the Warehouse in March.

Model 870 Special Field Shotgun (F. H. Smith)

This shotgun, due for introduction in 1984, has been developed to complement the Model 1100 Special Field, with similar appearance and performance features - 21" barrel, English stock, and cut checkering.

Research has approved the 12 Ga. trial and pilot production guns. 20 Gauge components are moving through the production lines.

Model 870 Restyle - 12 Ga. (J. L. Kast)

This 1985 gun is being developed to offer the shooter more quality appearance features. Specifications include a new fore-end, medium gloss finish, cut checkering, and 3" chambering.

Drawings and the parts list are complete and await Operations Committee approval for transmittal to the plant.

Model 870-1100 Deer Guns (F. H. Smith)

The Models 870 and 1100 Deer Guns, for 1985 introduction, are being developed to offer shooters a specialized gun. Specifications include a redesigned 21" slug barrel with a new rear sight base (capable of mounting a long eye relief scope). It will also feature Parkerized and matted metal finishes, with an oil-finished, birch fore-end and stock. A camouflaged sling strap will also be provided.

Drawings and a parts list have been given to Production for cost estimating. Testing of Research samples will be complete in January.

Research Department

December, 1983

Model 870-1100 Waterfowl Guns (T. J. Plunkett)

These guns (1986 introduction) are being developed to offer Waterfowl shooters a specialized gun. They will complement the Deer Guns and have common features of Parkerized metal finishes, and oil finished brick stock and fore-end. Also included is a 30" full-choke, vent-rib barrel with chromed bore, and a camouflaged sling strap.

Prototype guns for test and Marketing evaluation have been assembled. Research testing is scheduled to be complete by January 30.

Choke Tube Development (T. P. Powers)

A choke tube system is being developed to offer shooters the convenience of a variable choke barrel to adapt to different hunting situations encountered in the field. The initial strategy is to offer Briley choke tubes in mid-1984 and Remington tubes in 1986.

Testing of Briley's tube design is scheduled to be completed by February 15. Transmittal and approval is expected at the February Operations Committee meeting. The Remington design is to be tested by June 1984, with project approval and transmittal scheduled for August.

STATUS - RIFLE DEVELOPMENT (R. S. Murphy)

Model 700 Mountain Rifle (F. E. Martin)

The Mountain Rifle has been designed to deal with the higher end of the bolt action rifle line. It is scheduled for 1985 introduction as a replacement for the Model 700 Classic. Specifications include the lightweight Model Seven barrel contour, 30-06, 270, and 280 caliber offerings, and a new Bob Emmons style stock.

Stocks required for final accuracy testing have been completed by the Custom Shop and are being finished by Production. Accuracy testing will require approximately two weeks. Preliminary drawings have been given to Production for cost estimating.

New Bolt Action Rifle (F. E. Martin, K. L. Calkins, R. H. Smith)

A new bolt action rifle is being developed as a replacement

for the Model 700. A 1988 introduction is scheduled.

Model guns in three different configurations should be ready for review with Marketing by the end of May.

Sportsman 74/76

(A. R. Eddy)

These rifles are lower-priced versions of the Models 7400 and 7600, and continues the introduction of the Sportsman line of shotguns and rifles.

The drawing packages and parts lists are complete. Authorization to transmit is expected at the December Operations Committee meeting.

Model Seven Lightweight

(R. S. Murphy)

The Model Seven is a short, lightweight, bolt action centerfire rifle developed to replace the Model 600, which was discontinued in 1969. Trial and pilot testing indicated that the steel trigger guard assembly was unsatisfactory. A cast aluminum trigger guard has been designed as an alternative.

Trial and pilot productions guns with aluminum trigger guards are scheduled for Research verification testing in early February.

STATUS - CURRENT ARMS

(J. A. Lawrence)

Model 870 P Riot Shotgun

(A. A. Hugick)

Occasionally a shotgun shell can jam between the carrier and the slide assembly making the Model 870 P shotgun very difficult to operate. Several design modifications have been developed to prevent the malfunction.

Research has come up with a new design called the flexi-tab design. It requires the breech bolt and slide to be modified and the carrier to have the center section modified to act as a spring loaded shell stop.

Prototypes have been made and the system works well. Nine Model 870 P Riot Guns have been assembled with the new flexi-tab system. Samples have been turned over to our Field Representatives to evaluate with the F.B.I., California Highway Patrol, etc.

The new design corrects the jam condition, satisfied the complaints about the assembly/disassembly, and can be retrofitted

Research Department

-11-

December, 1983

in the field. Testing for field function and endurance is underway. The vendor for the change on the carrier has been contacted and prototype production samples are scheduled for mid-January 1984.

Model 1100 Performance with Premier Ammunition

The incident of "Don't Lock Open" is significantly higher with Premier ammunition compared with standard magnum loads. This is caused by the higher bolt velocities generated by Premier ammunition. Alterations to the Model 1100 Magnum are being considered which will more adequately handle this load.

Preliminary testing is focusing on reduced gas orifice diameter, and facing the front end of the action bar sleeve. The alteration to the action bar sleeve has the advantage of being more easily retrofitted. Tests are continuing.

Research Department

-12-

December, 1983

NEW PRODUCTS RESEARCH PERSONNEL

REMINGTON ROLL

As of 12/31/83

EXEMPT

Ammunition	12
Firearms	<u>28</u>
Total Exempt	40

NON-EXEMPT

Ammunition	12
Firearms	<u>8</u>
Total Non-Exempt	20

WAGE ROLL

Ammunition	0
Firearms	<u>17</u>
Total Wage Roll	17

DEPARTMENT TOTAL

77

Research Department

.i

December, 1983