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REMINGTON ARMS COMPANY, INC.

NEW PRODUCTS RESEARCH

FIRST QUARTER PROGRESS REPORT -- 1984.

MARCH 26, 1984

J.W. BOWER
W.H. COLEMAN, II
R.E. FIELITZ
D.S. FINDLAY
P.S. HEBERT
J.C. HUTTON
R.L. SASSONE
W.L. TOMEK
C.B. WORKMAN

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FIREARMS HIGHLIGHTS

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AMMUNITION HIGHLIGHTS

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FIREARMS

NEW PRODUCT DEVELOPMENT--SHUTGUNS

Model 1100 Special Field Shotgun

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

Research acceptance testing of Production's trial and pilot sample has been delayed due to questionable bolt velocities. Testing is expected to resume the week of March 12.

Model 870 Special Field Shotgun

This shotgun, due for introduction in 1984, has been developed to complement the Model 1100 Special Field, with similar appearance and performance features.

Research has approved the 12 gauge and LW-20 trial and pilot production guns. Production to the warehouse has begun on both shotguns.

Model 870 Restyle

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

The 12 gauge parts list and drawings package have been transmitted to the plant.

Samples and drawings for the 20, 28, and .410 gauges (all planned for 1986 introduction) have been started.

Model 870-1100 Waterfowl Guns

These guns 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 birch stock and fore-end. Specifications also include 26" and 30" chrome bored barrels, and a camouflaged sling strap.

Introduction of these guns has been changed from 1986 to 1985.

Prototype testing of the M/1100 is complete and samples are available for Marketing. A specification sheet for estimating has been given to Production. A drawings package will be complete March 16.

Model 870-1100 Deer Guns

These guns are being developed to offer deer hunters a specialized gun. Specifications include a redesigned 21" slug barrel with a new rear sight base capable of mounting a long eye relief scope. They will also feature Parkerized metal finishes, oil finished birch stock and fore-end, and a camouflaged sling strap.

Introduction of these guns has been delayed to 1986 in deference to the Waterfowl Guns. This new strategy will result in Production having more time to process the sight base, and will allow Research the opportunity to investigate a new 20 gauge slug-slug gun combination.

Choke Tube Development

A choke tube system is being developed to offer shooters the convenience of a variable choke barrel to adapt to different hunting situations. One option is to offer choke tubes patented and manufactured by Briley Manufacturing, Houston, Texas. The current strategy is to offer Briley tubes in mid-1984, and Remington tubes in 1986.

Research has tested and approved Briley's choke tubes. Remington designed tubes are scheduled to be tested by June 1984.

Production has been asked to determine comparative costs for manufacturing Briley and Remington choke tubes, either in Ilion or by outside sources.

Model 1100 Replacement

Research has begun a major new program with the objective of replacing the Model 1100 with a conventional shotgun that corrects the deficiencies of the Model 1100 and is able to sustain market share into the 1990's.

Research into the performance of the Model 1100 is almost complete. This research has pinpointed six deficiencies that need to be overcome in the replacement shotgun:

- carrier assembly design
- action smoothness
- gas system design
- component endurance
- weight
- styling

Specific programs for each of these areas are being developed. As they are developed in more detail, introduction schedules will be prepared.

NEW PRODUCT DEVELOPMENT--RIFLES

Model 700 Mountain Rifle

The Mountain Rifle has been designed to deal with the upper end of the bolt action rifle market. It is scheduled for a mid-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 stock.

Research testing of model guns was completed in February with good results. Research CAD modeling of the stock is progressing on schedule. The butt pad drawing will be complete by April 1. Production and Treasury are still working out the details before an economic evaluation can be done.

Model 7400/7600 Restyle

A need to condense the Model 7400/7600 line has been indicated by Marketing. Hybrids of the 7400/Model Four and 7600/Model Six have been proposed as entries in the upper end of the autoloader and pump markets. The lower end of these markets will be filled with the currently offered Sportsman 74 and Sportsman 76. Introduction of the new guns is scheduled for 1986.

In addition to building styling samples, Research is identifying areas of the rifles needing functional improvement. In an effort to improve extraction, rifles with oversize chambers have been built and processed through the gallery with excellent results.

New Bolt Action Rifle

A new bolt action rifle is being developed as a replacement for the Model 700 BDL. A 1988 introduction is scheduled.

Work is progressing, on schedule, on four model guns. These guns will exhibit various options for barrels, receivers, bolts, and fire controls. A review meeting is scheduled for May with Marketing.

CURRENT PRODUCTS

Model 870P Riot Shotgun

Occasionally a shell may jam between the carrier and slide assembly, making the Model 870P shotgun very difficult to open. Research has proposed modifications to the slide, breech bolt, and carrier, in an effort to eliminate this potential problem.

One Model 870 with the proposed changes has been cycled over 100,000 times with no problems. A second carrier was cyclically loaded to simulate a trapped shell. The flexi-tab on this carrier cracked at between 10,000 - 11,000 cycles, and broke at approximately 12,000 cycles.

An additional 100 carriers have been received from the stamping vendor. After processing, fifty will be made available to Marketing for field testing. The remainder will undergo additional testing in Research. Pending successful test results, a model drawing transmittal should be made by the end of March.

Model 870P Riot Shotgun

Complaints were received from the Ohio State Police that, in sub-freezing temperatures, the folding stock, sold as an option on the Model 870P, would become inoperable. Research determined that the clearance between the stock and pivot pin was insufficient to compensate for the different coefficients of expansion of the stock and pin.

The pivot pin has been redesigned to provide adequate clearance. A quantity of pins to the reduced diameter have been purchased, and will be made available to the Ohio State Police for retrofitting in their Model 870P shotguns with folding stocks.

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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

A low frequency (4%) of cap movement was observed at 150°F in machine headed product due to gas leakage around the primer. No other product casualties have been found at any test temperature.

Modifications to heading pins and cavity punches have been successfully evaluated in a small sample. Larger samples of hand headed, hand loaded product are currently being prepared for testing at all temperatures with results expected before month's end.

10 Gauge

Due to problems encountered in forming small, straight primer bores with the original 10 ga. straight wall tooling, a tapered shell is currently being designed. The advantage of the tapered shell is that a thinner bridge product can be made while maintaining necessary internal volume. This thinner bridge will ease the problems associated with forming the primer bore and maintaining head diameter. Initial samples should be ready for load development work late in April.

12 Gauge 2-3/4"

Modifications to the AH&P heading stems to correct domed heads and primer movement has been successfully evaluated on a full scale plant run. The new tooling is currently being used by Production on a continuous basis.

Modifications to the prehead punch at the body forming operation has eliminated corner tears in the base section. As was hoped no additional tooling modifications at subsequent operations were required. Continued testing of product by ballistics has confirmed earlier test results with no casualties reported.

With the issuance of addenda detailing recent changes at body forming and AH&P development of this body will be complete. This tooling is now in use.

20 Gauge

The 20 ga. rifled slug load passed all aspects of the product acceptance tests except accuracy. Retest of different lots were within specification. The product is currently being warehoused.

20 Gauge Target

Smooth bodies for target loads are currently being produced in Bridgeport and shipped to Lonoke for processing. Samples were headed and loaded and submitted for product acceptance tests. Testing to date indicates that the heading operation should be improved.

One dropped primer occurred out of 200 rounds fired at 150°F. This round appeared different from the remaining samples. The primer pushout force on the entire sample was below Lonoke's minimum specifications.

A very high incidence of crimp and body splits was observed on product which was shot at -20°F. Close inspection of the loaded rounds indicates these splits are due to severe crimping forces. Standard trim and skive tools were used on the loader which resulted in higher crimping forces to form and close the crimps. In addition, a check of the storage temperature revealed temperatures of -30°F to -40°F which may have aggravated the splitting problem. A retest is scheduled for March 27.

28 Gauge

Tool trim-in on the production body former has been progressing favorably. Bodies are dimensionally correct. The heatset drum and feed from the body former have not been installed, due to machine acceptance run. Plans are to install these during the week ending 3/31, and to complete the tool trim-in immediately after.

Since there is no AH&P capacity for 28 ga. product in Bridgeport, current plans are to produce bodies, hand head and load using brass caps for testing by mid-April.

.410 Bore

Testing completed thus far on the 2-1/2" .410 bodies have been very promising. Reloading life is considerably better than that of the plant-produced bodies, and function and casualty in severe guns show no heading defects. Problems of "rim bursts" previously seen on the brass caps when used on the 3" shell have not been seen with the 2-1/2" shell.

Slug production on the Research extruder continues to be a major problem. Wall variation cannot be held within acceptance limits (±.003). A new controller has been installed on the extruder. Testing should be done during week of March 31.

"Premier" Centerfire

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.

200 yard accuracy and ballistic coefficient testing of hand formed .30 cal. secant ogive bullets have been conducted in Lonoke. All rounds were hand loaded and fired in U.R. barrels. Results are summarized below.

	200 yd. Accuracy 3/5 Shot Groups	Ballistic Coefficient Predicted	Actual	%Error
Control 180 gr. PSPCL	2.6"	.383	.362	5.5%
168 gr. Boattail Power Curve Sample	2.6"	.502	.506	.8%
180 gr. Boattail Power Curve Sample	3.2"	.543	.527	2.9%
180 gr. Flat Base Power Curve	2.8"	.485	.478	1.4%
180 gr. Flat Base Secant	1.6"	.488	.484	.8%

As can be seen, accuracy and ballistic coefficient with the secant ogive sample was very good. The predicted ballistic coefficients agree well with actual values. It should be noted that the secant ogive flat base bullet outperformed Sierra's 180 gr. spitzer boattail bullet (Bal. Coef. .462) tested in June 1983.

Mush of hand formed secant ogive bullets into gelatin was inconsistent. Hand forming requires the use of unannealed jackets which also inhibits good mush. Samples with nose cuts performed well. Further testing will take place with machine formed bullets.

Secant ogive bullets with smaller meplats than current product but larger than desired (.080 sample vs. .100 control) have been formed on the prototype bullet assembly machine without any modifications to the machine. Slight modification of the bullet forming dies should help to form bullets with meplats small enough (.050) to achieve superior ballistic coefficients. Accuracy and mush testing of bullets made to date is in progress.

A work request has been approved for Fred Schmidt, ETL, to investigate methods of chemically polishing centerfire brass cases. Samples have been produced by R. H. Miller with an acceptionally bright surface finish. Initial samples had metal removal rates of 0.5 gm/case which was above our arbitrary goal of 0.1 gm/case. The higher removal rate was due to increased bath temperature (128°F actual vs. 120°F control) and aeration of the bath.

R. H. Miller has processed additional samples with equally good finish with metal removal rates of ∿ .2 gm/case. Measurement of the case wall by Miller indicates a reduction in thickness of .0008" which is insignificant. ETL has fully characterized six cases which were sent to Miller for polishing. These will be returned to ETL for recharacterization and confirmation of the metal removal.

High spot economic analysis indicates an incremental net return of 75% on a permanent investment of $700M for bullet gauges required for the new bullet profile, bullet burnishing and case polishing equipment. A detailed report draft covering the performance improvement and economics expected for centerfire "Premier" ammunition has been prepared. The incremental Sales Forecast increase ($2.5MM ammo./$0.5MM component bullets) for the bullet performance and bullet and case appearance improvements was not included in the Centerfire Modernization Project.

"Premier" Shotshell

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

Hercules propellants used in all magnum "Premier" shotshell have demonstrated unacceptable ballistics sensitivity to environmental storage conditions. ARD tests have confirmed it is due to relatively large changes in moisture content of the powder.

Two paths are being pursued. First an immediate attempt is being made to develop alternate powders/primers and powder sources. Second and longer terms ARD is investigating the possible causes for the ballistics sensitivity of 259/HM90 powder.

Five powder manufacturers have been contacted and sent components for use in powder development. They are:

Bofors (Sweden)
Kimera-Oy (Finland)
Expro (Canada)
Olin (Florida)
Hercules (New Jersey)

Sample powders are enroute from Kimera-Oy. Olin and Hercules samples have been received. Preliminary indications show a faster powder with a lighter pellet primer yields improved ballistics and reduced sensitivity to storage conditions. Testing of the Olin and Hercules samples will be complete in early April.

Samples of 259 powder manufactured in 1979 and 1983 have been sent to Structure Probe for surface analysis. We expect results in late March. ARD evaluation of several early lots of 259 revealed a wide range of ballistics responses under the extreme storage conditions. In earlier tests we established a position that the older powder did not exhibit the undesirable response. Additional testing of other lots now shows the ballistics are equally bad. We now believe the moisture problem is related to the 259 formulation and not the process conditions. Charles Helle has been sent these powder samples and will be conducting tests in an attempt to determine the cause of this problem.

Remington Target Loads

Marketing has developed a program to introduce the Remington Target Load in all target gauges during the summer of 1985. Previous to the formal introduction however, extensive field testing of the products in blue bodies is planned. The technical elements for all target gauges have been determined and are as follows:

- Smooth, green Rotary Cam Unibodies (yellow in 20 ga.)
- #209 Primer (reduced pellet weight in .410)
- New RTL wad (12 gauge only)
- Brass caps (including .410 and 28 gauge)

A critical item in the overall RTL program is the new RTL wad. Based on a Marketing request the candidate wad was originally designed for the component trade and features a flared shot pouch for ease of reloading. A wad mold to produce 30MM/yr. has been ordered by Lonoke. However, as a factory loaded component, the wad will present considerable feeding problems at the duplex loaders. Redesign of the pouch section to minimize the flare will reduce these feeding difficulties and this effort is presently underway. Mold tooling presently installed in a Bridgeport Semi-Works injection molding machine will be reworked to incorporate the modified design.

A meeting was held in Lonoke with Production, Marketing and ARD personnel to review these program items. Future regular meetings are planned to insure the technical criteria and market test needs are fulfilled on schedule.

Steel Shot 20 Ga. 1 oz. Load

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.

Marketing has requested development of this product to match competition, however, a 1 oz. payload in the New Unibody Shell is not possible due to internal volume limitations. A 15/16 oz. payload can be obtained but this is not competitive with the Winchester and Federal 1 oz. offerings. After review with Marketing, it was agreed to develop the 15/16 oz. payload.

Three shot container wad design concepts have been proposed for the 20 ga. load and all have certain limitations. The wads considered are as follows:

1. Diverging fin shot container
2. Straight fin, mechanically slit shot container
3. Straight fin, molded-in slit shot container

Wad #1 is designed similar to Remington 12 ga. steel shot wads and based on production experience, is difficult to feed reliably. Wad #2 requires a separate, mechanical slitting operation after molding which will increase cost. Wad #3 requires careful design to minimize the gap at the fin slits.

Based on the more critical limitations of Wads #1 and #2, wad #3 has been selected for development. An outside vendor, Automatic Injection Molding, Inc. of Berkeley Heights, N.J. has submitted a quote to fabricate a one cavity mold and supply 10M experimental wads with a maximum slit gap of .015". Delivery of wads is expected six-eight weeks after receipt of our purchase order and load development will begin at that time.

Rifled Slugs

Development of heavier rifled slugs has been requested by Marketing to meet competitive offerings.

Ballistics at R.T. -20 and +150°F and accuracy of 12 ga. 2-3/4" 1-1/4 oz. Rifled Slugs loaded by the plant was within specification. A slight bulge in the shell caused by a tight load fit not evident in hand loads will require the use of a slightly shorter pakline wad. A second run has been scheduled for April.

ABC Primer

The ABC (integral anvil) battery cup has the potential of significantly reducing costs through automation and improving quality through assured anvil positioning.

Testing using the original three flash hole design indicated a potential for blown anvils with some primer mixes. Experimental four flash hole primers have successfully maintained mechanical integrity.

Experimental 5th anvil draw four flash hole tools, modified to eliminate a slight shaving at the base of the anvil, were run in the press. The shaving at the base of the anvil was eliminated but the anvil height was reduced in the process. Subsequently, experimental tools were designed and fabricated for the entire anvil draw progression, excluding the cupping station.

The reduction increase, previously concentrated at the 5th anvil draw station, has now been spread through the entire anvil draw progression. A test run with the new anvil draw progression did not meet expectations. The effect on individual stations will be analyzed in April.

All experimental four flash hole tools were removed from the ABC press on March 20 and replaced with standard three hole tooling to allow Production to start producing the three hole ABC battery cup for promotional loads. All future experimental runs will require close coordination and scheduling with Production.

Copper Crusher/Transducer Correlation

Samples of .30-06 150 PSPCL were hand loaded to 480 CUP with each of the following powders:

Bullseye
2400
4198
3031
WC-759
4064

Transducer pressures for the same load ranged from 46,000 to 64,000 psi. Pressure time curves produced by the faster powders exhibited steeper rises, lower peaks, and faster decay times than slower powders. These results support our theory that the dynamic (as opposed to the static) component of crusher deformation due to piston deceleration is a function of powder, primer and bullet weight. These and prior tests strongly suggest that transducer

pressure control is not only acceptable but a more realistic view of internal ballistics. A final report will be prepared in April.

Consolidation

A project has been approved to consolidate Bridgeport Ammunition Research with Ilion Firearms Research within the Ilion facility. It is anticipated the project will be completed in August, 1984, with the transfer of all personnel.

General layout of proposed construction has been approved and a purchase order has been issued to prepare bid packages. Layout details have essentially been completed, and are in the final stages of review. Some minor changes are required to accommodate the differences between firearms and ammunition. These should be incorporated within two weeks.

A generalized exit plan for the Bridgeport Research site has been prepared and preliminary work started. The vast majority of hazardous materials, many of which were accumulations over the years, have been properly disposed of. Screening and consolidating files and the Research Library are well underway.

An accounting system is in place for cost control.

Centerfire Modernization

Economics for the centerfire rifle progressive jacket draw and bullet assembly equipment is being prepared by the Lonoke plant. The project is based on a labor savings only. It does not include permanent investment or operations for new bullet profile gauges, bullet burnishing or case polishing equipment. ARD has prepared an addendum to the project covering the technical and economic details for the added investment required to obtain the incremental sales forecast. The project is slated for review by the Committee in early April.

W.H.Coleman,II:mf

NEW PRODUCTS RESEARCH

PERSONNEL

REMINGTON ROLL

	Actual 2/29/84	Actual 3/31/84	Forecast 12/31/84
Exempt			
Ammunition Research	9	9	8
Firearms Research	27	28	33
Total Exempt	36	37	41
Non-Exempt			
Ammunition Research	11	10	6
Firearms Research	10	11	12
Total Non-Exempt	21	21	18
Wage Roll			
Firearms Research	16	16	17
Total Wage Roll	16	16	17
Total New Products	73	74	76

RESEARCH PERSONNEL AS OF MARCH 31, 1984

Ilion Division

EXEMPT 28	NONEXEMPT 11	WAGE ROLL 16
Balaska, Robert J.	Eskoff, Sophie S.	Baggetta, Joseph A.
Bauman, Thomas G.	Jones, Raymond A.	Beader, Robert W.
Bower, James W.	Martin, James S.,Jr.	Bedworth, Gary R.
Calkins, Kevin L.	Schuster, Joyce M.	Butler, Richard G.
Coleman, Wm. H.,II	Scram, Wendy L.	Fiorentino, D.J.
Curry, Wm. M.	Smith, Floyd H.	Harter, James D.
Eddy, Albert	Smithson, Ronald	Howe, Robert W.
Findlay, David S.	Stephens, Charles	Jennings, Dale E.
Franz, Scott R.	Supry, Fred	Kozakowski, Robert J.
Hand, Charles J.	Urtz, Donald	Paslak, Wm. F.
Hennings, James H.	Weaver Harold E.	Sohns, William A.
Hugick, Adam H.		Storne, Ramon
Hutton, James C.		Truax, Irving E.,Jr.
Kast, Jack L.		Williams, Clifford
Lawrence, Jeffrey A.		Williams, Donald
Martin, Fred E.		Williams, Ronald R.
Murphy, Randall A.		
Nightingale, Richard E.		
Plunkett, Thomas J.		
Powers, Thomas P.		
Rankins, Edwin D.		
Rowlands, Kenneth		
Sanzo, Robert J.		
Sassone, Richard L.		
Saunders, Eugene L.		
Smith, Robert		
Snedeker, James R.		
Yetter, Edward W.,Jr.		

TOTAL ILION PERSONNEL: 55

Bridgeport Division

EXEMPT 9	NONEXEMPT 10	WAGE ROLL 0
Cole, William T.	Alexander, Bruce R.	
DesJardins,Chas.F.,Jr.	Buccitti, Dominick C.	
Dwyer, John M.,Jr.	Champine, Barry M.	
Garrett, Thelma B.	Frauenberger, Marion O.	
McDonald, A. Daniel	Green, Jeffrey R.	
Peterkin, Vinton A.	Jackson, Charles L.	
Simpson, William R.	Montefusco, Stanley,III	
Sroka, Lee R.	Raimundo, John A.	
Tomek, Warren L.	Stine, Cindy A.	
	Suhy, Frederick A.	

TOTAL BRIDGEPORT PERSONNEL: 19

Note: J.R. Snedeker (Ilion) Exempt transferred as Res.Supervisor Testing, Measurements & Mech. Analysis as of 3/1/84
G.A. Stine (Bpt.) Nonexempt transferred to Sorvall, Newtown, CT as of 3/5/84
R.A. Jones (Ilion) Nonexempt successful bidder to Dept. 9097 as a Draftsman as of 3/1/84.