file

REMINGTON ARMS COMPANY, INC.

RESEARCH AND DEVELOPMENT - FIREARMS

FIRST QUARTER PROGRESS REPORT - 1981

April 1, 1981

HIGHLIGHTS

Page

New Product Development

- Four 3" magnum models of the XSG autoloader shotgun will be completed by mid-April. These models feature the action spring forward design with a modified barrel contour for reduced weight and an improved locking system. Completion of the Preliminary Design is scheduled for July. 3

- Results of Warehouse Quality Audits on the M/7400 centerfire rifles indicate that visually the new rifles are superior to comparable M/742's. However, malfunction rates are unacceptably high (4.6%), particularly for feeding malfunctions. Plant and Research personnel are working with the magazine box vendor to solve the problem. 4

- Trial and Pilot testing on the M/870 Competition Trap shotgun has been completed and guns approved for warehousing. 5

- MAPCO has placed an order for 100 additional Model 979 Seismic Guns for 1981. The first three guns have been shipped and a schedule has been established for completing the order. 6

- Model Requirements for the Bolt Action Carbine have been defined and actions are complete with the new lighter barrels. Marketing will review new models by mid-April. 6

LIMITED DISTRIBUTION

Remington Arms Company, Inc.

BARBER - PRESALE R 0108774

Page

Current Product Development

- Functional tests of the new M/700 bolt lock and fire control designs have been successfully completed. Alternative designs to improve appearance of the bolt plug are in progress. 6

- Modifications to the M/788 safety have been approved pending acceptable experience by Production with 2,000 prototype components. Alternative button designs are in progress. 7

- Initial warehousing of Ducks Unlimited shotguns should be on schedule in July 1981. Modified emblems and receiver roll marks are scheduled for delivery by the end of April. 7

- To reduce fatigue related failures of M/1100 links, use of shot peened parts and a change to a higher strength steel are being evaluated. 7

Process Development

- The Auto-Drill Line is on a full two shift operation and has produced approximately 50,000 blanks to date. Machining quality, production rates, and tool life have met or exceeded project goals. 7

- Automatic polishing of receiver top and bottom radii using an ASEA industrial robot has been successfully demonstrated. The system will be available for limited production use during the second quarter. 8

- The Four-Slide Machine has been delivered to the tooling vendor and is scheduled for delivery to Ilion by June 1, 1981. 8

- Initial tests with laser welded M/1100 slide blocks to action bars has been unsatisfactory. Additional samples are being provided by DuPont- ETL. 9

- Preliminary test results on machined Torlon M/1100 piston seals were encouraging. Durability exceeded 14,000 rounds. Molded piston seals are scheduled for delivery and testing in June. 9

STATUS - NEW PRODUCT DEVELOPMENT

XSG/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 of the program include decreased weight, increased reliability, and increased use of common parts for reduced manufacturing costs. New designs are in progress on the gas system, action spring, feeding system, and locking system. Completion of the preliminary design is scheduled for July 1981.

Four magnum models of the XSG autoloader will be completed by mid-April. These models will include a modified model A3 locking system, a square wire action spring forward around the magazine tube, and improvements to the fire control system (e.g. a one piece connector, improved trigger, and modified hammer configuration). Also included in the models will be a new barrel contour strengthened over the 4½" chamber position and redesigned for weight reduction, wide vent rib for magnum models, integral ejector, wide extractor, receiver bolt buffer, reverse stock bolt attachment, modified model 1100 type gas sytem piston and seal, new magazine cap and detenting system, improved feed latch system, and simplified interceptor latch. Improvements to the action bar assembly in the feed cam, carrier dog notch and carrier tab cuts are included in assemblies for the four model guns. Cut checkered stocks and fore-ends will be available for these model guns.

The above features are the basis for the Preliminary Design to be transmitted in July. However, work is continuing on contingency designs for critical components as follows:

- Improvements to the modified A3 locking system which include further strengthening of cams on the slide block, reduction in overall cam-locking block movement, and strengthening of locking block web areas where cracking was experienced in earlier prototype testing.

- Redesign of an experimental sliding pivot locking system and modifications to the slide block - action bar assembly.

- Evaluation of a forward bleed-off gas system using wave and belvelle washers for a pre-load on the bleeder ring. Initial test results have been favorable. Bolt velocities for magnum loads have been reduced with no affect on light loads. A 2" downbore orifice position is also being evaluated for effect on bolt velocities and PT curves.

- Development of a simplified feed system to be utilized on both the XSG and XPG models.

- Design of a fire control system with simplified release and latching mechanisms and reduced number of parts compared to the M/1100 design. A one piece carrier latch has been fabricated and a new release has been developed to allow free carrier movement during loading of the magazine.

Shotgun computer modeling is being pursued by both Remington and DuPont ETL personnel. The Remington program is nearly complete and now plots bolt velocities and gas system pressure. Some inadequacies still exist in the gas system equations. These are being improved with the help of DuPont EDL personnel. A computer simulation of the dynamics of gun firing has been provided by Dr. Boger of EDL. This program will be instrumental in the HPX program to develop a steel shotshell. Work is being done now to adapt this program to run on the IBM M/370 computer.

Preliminary design of a new "XSG only" safety is complete and a single prototype has been built. The new design features a blocked hammer with trigger disengagement from sear by means of a connector lift. The safety style and operation is similar to that of the military M-1 Garand, with a lever (not button) operating through the trigger guard in a front to back motion. The prototype is currently in the Test Lab for evaluation.

Model 7400 Autoloading and Model 7600 Slide Action Centerfire Rifles

The M/7400/7600 rifles were developed as replacements for the M/742/760 rifles and were introduced into the product line in 1981. Features of the new rifles include smoother action, improved locking system, and more attractive styling. Shooter acceptance of the new line has been good. However, the Plant has experienced a variety of production start up problems requiring continued support by Research personnel. In addition to the routine assistance provided by the design group, a special Task Force of Plant and Research personnel was formed to implement long-term solutions to the problems. Although gallery reject rates have not yet achieved an acceptable level, progress is being made and rates should decrease to a more normal level as the Plant develops experience in production of the new models.

Task Force programs have been completed on analysis of gallery reject data, component measurements, interviews with Production personnel, a 100 gun correlation study, and a Warehouse Quality Audit to compare M/7400's with comparable M/742's. Data from these studies are being analyzed to prioritize problems and to identify causes and solutions to those problems.

Results of the Warehouse Quality Audits indicate that visually the M/7400's are superior to the M/742's. However, field test results confirm that overall malfunction rates are unacceptably high on the new rifles. Feeding malfunctions were particularly high.

Results of test firing the correlation study rifles confirmed a high feeding malfunction rate. The magazine box design and fit relative to the receiver appears to be a major cause of feeding malfunctions. A new box design is in progress and prototypes are being fabricated. However, confirmation of the new design will require at least six months. In the meantime, work with the vendor is progressing on fabrication problems with the current box and new gages have been completed by PE & C to assure that boxes conform to model drawings. Past test results indicate that, if properly fabricated, the current design can produce extremely low (1.5%) malfunction rates.

Model Four Limited Edition

Two fore-ends with rosewood tips are being evaluated (functioned, etc.) in the Test Lab to determine acceptability of this particular design for the Model Four Limited Edition. Efforts have been initiated by Process/Purchasing to qualify an alternate vendor for the etched receiver. Research plans no further work on the receiver until this has been resolved.

Model 870 Competition Trap Shotgun

The Competition Trap Shotgun is a special single shot version of the present Model 870. It has a unique gas operated recoil reduction system.

During Trial and Pilot testing in January, the Plant experienced a problem with alignment of the barrel and receiver assemblies. Drawings were checked and results indicated that, in the worst case, present tolerances could cause an interference. The gas cylinder diameter was reduced to alleviate the problem. Two shotguns with modified cylinders were tested with the following results:

- No appreciable change in piston velocities.
- No detectable change in gas leakage past gas cylinder.
- Shoulder forces comparable to the initial design.

The gas cylinder drawing was changed and production is continuing. Trial and Pilot has been completed and guns are being warehoused.

Model 979 Seismic Gun

The Model 979 Seismic Gun is an adaptation of the Remington kiln gun. Development of the gun, which is used in geological studies, has been a joint development by Firearms Research, Ammunition Research, and MAPCO. All guns produced to date have been converted kiln guns, with Ilion replacing the conventional breech block with an electrically actuated design for simultaneous firing of several seismic guns.

MAPCO has placed an order for 100 guns to be shipped in 1981. The first three guns have been shipped, and a schedule agreed upon by Marketing and Research for shipment of the balance. The controlling factor in meeting these shipments will be receipt of the Hofmann guns for conversion (or delivery of components for assembly here, if this option is chosen). Building of the electric breech block assemblies will not be a problem.

With receipt of component drawings now accomplished, completion of the draft version of the operating manual is proceeding. This should be available for review by the end of March.

Bolt Action Carbine

This carbine is a short barreled, light weight, bolt action, centerfire rifle being developed as a replacement for the Model 600.

Model Requirements have been defined by Marketing and Research. Barreled actions are complete with new lighter barrels. Stocks of the latest design will be completed in early April for Marketing to review.

STATUS - CURRENT PRODUCT DEVELOPMENT

Model 700 Bolt Lock and Fire Control

Since inception of the M/721 - 722 bolt action rifles, Remington has used a fire control with a bolt lock integral to the safety lever. New bolt lock and fire control designs have been developed as a part of an ongoing program to improve the functional characteristics of our current M/700 Bolt Action Centerfire Rifle line.

Functionally, the new design features a bolt lock separate from the safety and has been accepted by Marketing. However, due to objections about appearance, a redesign of the bolt plug is in progress. An alternative design will be completed by mid-May for Marketing review. Work has also been initiated on design of integral scope mounts and rings and improved styling for both the ADL and BDL product lines.

Model 788 Safety

The present M/788 rifle has been in the product line for several years. A redesign of the safety was initiated as part of a continuing effort to improve styling and function of our current product line. Basic operation of the new design has been successfully demonstrated and the concept approved pending acceptable experience by Production with 2,000 prototype components. However, due to objections about styling, alternative safety button designs are being evaluated and will be reviewed with Marketing to establish an acceptable shape.

Model 1100 Ducks Unlimited

Marketing has developed a four year program with the option of a fifth year, to build special model shotguns for the Ducks Unlimited Organization. The program will include three special production models each year.

Drawings were transmitted for the three models to be warehoused in July 1981. Problems were encountered when the vendor started tooling up to make an emblem that will be attached to one model. A new vendor was established by Purchasing and the parts will be available to Process Engineering by the end of April. The Ducks Unlimited Organization asked for a change in the artwork to be rolled on the receiver of the same model. Drawings have been changed and the vendor has begun work on the rolls which will be completed by April 15, 1981.

Model 1100 Link Breakage

In a competitive shotgun evaluation, an excessive number of link failures were experienced. Approximately 70 links were replaced at the Grand American Trap Shoot last fall. Plant records indicate approximately 5,000 links were sold last year as spare parts.

Evaluation of the parts indicate failure due to fatigue loading. Methods being pursued to reduce breakage are shot peening, use of a higher strength material and redesign to decrease operating stresses. Tests of shotpeened parts are being scheduled in the Lab. High carbon steel parts with increased strength are scheduled for delivery from the vendor by mid-April.

STATUS - PROCESS DEVELOPMENT

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 drilling process has been developed utilizing proven machining methods and completely automatic part handling to replace the current process.

The Auto-Drill Line has produced approximately 50,000 blanks to date and is on a full shift operation. Machining quality has been excellent, production has exceeded predicted rates, and tool life is better than anticipated. While a detailed cost summary was not available, estimates indicate that total cost will be less than the Authorized Expenditures and will be within 10% of the Part II authorization. Major factors limiting sustained operation are due to problems with the Smoke Removal and Oil Filtration systems. Research personnel are working with the Plant to solve those problems and to establish routine Production operation of the system by mid-April. Electrical and hydraulic engineering drawings and a complete spare parts stock list will be provided by June. Closeout of the project is planned by July.

ASEA Manipulator

Rifle and shotgun receivers are rough and finish polished by a labor intensive hand process. Based on the demonstrated ability of an industrial robot to automatically polish M/742 and M/760 receivers, Project RXI-63 was authorized to purchase an ASEA programmable manipulator.

Experimental polishing of the top and bottom radii has been satisfactorily demonstrated. Experimental polishing of receiver side panels indicates that forces above the rated load of the manipulator may be required to obtain a suitable finish. Revisions to the gripper design, which may reduce the force level, are being investigated.

An ASEA representative was in Ilion in early March to review contouring problems with the manipulator. Corrections to the machine should be complete by April 3rd, after which development work will be resumed.

The system should be available for limited production on a manual load basis during the second quarter, 1981.

Four Slide Machine

This automatic manufacturing system for in-house production of precision formed stampings will enable Remington to develop an expertise in stamping manufacture and eliminate our total dependence on costly outside suppliers. The main advantage of this type of machine over a punch press, on which most of our stampings are currently produced, is in the four forming slides positioned around a central mandrel, which is an ideal arrangement for forming the type of stampings used in Remington firearms.

Prior to expiration of Remington's contract with its principal stamping vendor, the four-slide machine will be used to make prototype parts for Research.

The four-slide machine has been delivered to the tooling vendor for assembly of the dies to form the M/7400 magazine follower. However, a delay in completion of special cams by Torin will result in a postponement of the machine. Projected delivery to Ilion is now June 1st.

Laser Welding

Model 1100 and Model 870 shotgun slide blocks are currently brazed to action bars or slides. The brazed joints are inherently unreliable, and difficult to inspect without destrirctive testing. In place of brazing, a laser welding process has been proposed with an estimated gross savings of $30,000 per year, and a 38% ROI.

DuPont ETL has laser welded a quantity of M/1100 slide blocks to action bars. Testing, in Ilion, has so far been unsatisfactory, with the welds breaking in less than 100 cycles. Additional samples are being produced by ETL.

Torlon Piston Seal

A new stainless steel stamped piston and high temperature plastic piston seal are being investigated for auto-loading shotguns. Implementation of this design into the M/1100 will result in an annual savings of $100,000. In addition to this cost improvement, a reduction in gas system corrosion problems should result.

The high temperature plastic currently being tested has the trade name Torlon, and is a product of Amoco Chemical. Torlon is presently used by the Department of Defense for several military components. Alternative DuPont materials are also being researched.

Preliminary testing, using machined Torlon seals, endured 14,000 rounds prior to failure. Molded Torlon seals are due the end of May, at which time testing will resume.