

R. B. Hurley

LIMITED DISTRIBUTION

FIREARMS RESEARCH DIVISION

PROGRESS REPORT

FEBRUARY 1980

Remington Arms Company, Inc.

HIGHLIGHTS

FIREARMS

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Product Development

Model XSG Shotgun

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Testing is continuing on the current prototype model. A total of 3750 rounds has been fired using 2-3/4 Magnum loads without major component failure.

Model 870 Competition Trap

Modified fore end tube designs were tested with satisfactory results. During the testing of the new fore end and tube designs premature cracking of the receiver was detected.

Model 7400 - 7600

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Twelve production Model 7400 rifles, consisting of a selection of 30-06, 270 and 7mm Exp.Rem. calibers were tested successfully for bolt velocity verification.

21MM Seismic

2

MAPCO has returned twelve guns for corrections of the breech bolt, firing pin and alignment problems that were encountered in the field. Twenty five thousand (25,000) rounds of ammunition have been received from MAPCO for our field testing use.

Process Development

ASEA Manipulator

3

Receiver handling conveyor system design is being reviewed. Three quotes have been received ranging from \$20M to \$33M. An order will be issued to fabricate the system in early March.

High Energy Beam Application

3

Laser Welding Preliminary results of the EDL welded M1100 slide block and action bars are expected in March.

Wood Decorating Samples of the Ducks Unlimited emblem carved in the M1100 stock were received. Additional samples of laser carved stock and fore ends are expected in March.

Integral Ejector

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Tooling modifications have been made to support the outside of the barrel to reduce the bulge in the area of the LT-20 ejector. Four barrels have been produced and are in test.

Rivetless Extractor

7

Satisfactory testing on the small caliber rivetless extractor without the anti-rotation projections has been completed. Part drawings are being finalized for transmittal to Production.

RESEARCH SECTION

Product Development

Model XSG Shotgun

A new autoloading shotgun is under development for introduction in the 1983 or 1984 model year. The design goals of lighter weight and reduced manufacturing cost have been incorporated in the prototype currently in test. The prototype model has been fired 3750 rounds using 2 3/4" Magnum loads without major component failure. However, slide blocks have separated from the action bar at the braze joints.

Design investigation into the slide block separation problem is in progress. The joint area and the braze operation also are being reviewed.

The action spring has been redesigned to improve the problem of spring setting. At 3,000 rounds the spring has a set of 1.560 inch (the spring is 13 inches long). A new square wire spring design was completed and sample springs ordered from Connecticut Spring Company.

The Locking Block - Actuating System is being redesigned for better mass distribution at unlock. The revised locking system is in the final design stage. The gas system is being evaluated for an expansion/cutoff. A M1100 has been converted to automatically cutoff the orifice as the action moves rearward. Initial Measurements indicate that the bolt velocity will be reduced to a greater extent on magnums than it is on light loads.

21MM Seismic

A 21MM (8 gauge cartridge and gun system) is being evaluated for MAPCO which is to be used for seismic exploration for oil and gas. An electric ignition design breech bolt has been developed for incorporation in the standard industrial 8 gauge kiln gun. The breech bolt - fire control system was designed to be interchangeable with percussion style bolt.

Twelve standard kiln guns were modified for electric ignition and shipped to MAPCO. Problems with the breech bolt - firing pin system as well as alignment problems were detected in the field. The twelve guns have been returned for design correction and modification.

A program to redesign the breech bolt and mating parts to assure model interchangeability has been expedited. An extensive endurance and interchangeability test program is currently under way. One gun will be endurance tested to 20,000 rounds. The major components such as the breech bolt and receiver will be dimensionally measured to determine the approximate tolerances and these dimensions will be used in a later test.

The interchangeability test will consist of firing 20 rounds in each gun/breech block combination. The five worst cases will be selected and used in the dry cycle test. The dry cycle test consists of two tests; one for mechanical wear of the firing pin and insulator, the other for arc erosion of the firing pin tip. The final test is the 20,000 round endurance test. The target reliability is 99.83%. This will give us an overall reliability of 98% for simultaneous firing of 12 guns which is the most that can be reasonably expected in the field.

The target date for completion of these tests is April 1, 1980.

High Energy Beam Application

Laser Welding M1100 and M870 shotgun slide blocks are currently being brazed to action bars or slide plates. The brazed joints are inherently unreliable and difficult to inspect without destructive testing. Scrap rates run as high as 20% in subsequent operations. A laser welding process was proposed to replace the troublesome brazing operation. The estimated gross savings are \$30M per year at a 38% ROI.

Parts have been redesigned, fabricated and submitted to EDL for laser welding. Preliminary results are expected in March. *No change*

Wood Decorating Laser wood carvings offer improved aesthetics over the current pressed checkering method of stock and fore end decorating. Laser carving is comparable in detail to the traditional and expensive hand carving methods but at greatly reduced cost. Samples of carved stock for the next edition of the Ducks Unlimited shotgun have been obtained. Additional samples of carved stocks and fore ends are expected in March. *No change*

ASEA Manipulator

Rectangular rifle and shotgun receivers are rough and finish polished. These labor intensive operations are most expensive in firearms production. ASEA, Inc., an industrial manipulator manufacturer, demonstrated the capability of automatically polishing M742 and M760 receivers. The estimated gross savings are \$67M per year.

All support equipment has been received and installed with the exception of the part handling conveyor system. Three vendor quotes were received in February. The quotes ranged from \$20M to \$33M and are currently being reviewed. An order is expected to be placed in

ASEA Manipulator Continued

early March. Delivery is estimated to be 8 to 14 weeks.

The complete system startup is expected during the second quarter of 1980.

(3) The project timing was revised to insure successful completion before any other large capital expenditures. Programming, acquisition of a receive alignment system to overcome the panel alignment problem, and a trial and pilot run must be completed before submitting the ASM to the next conveyor. The trial and pilot run is scheduled to commence in June 1980.

STATUS REPORT

Product Development

Model 1100 LT-20 Limited

Trial & Pilot guns were tested satisfactorily. A special field test with 8 boys and girls, ages 10 to 14, was successfully completed. The guns were accepted and approved for production.

Model 7400 - 7600

Twelve Production Model 7400 rifles consisting of a selection of 30-06, 270 and 7mm Exp.Rem. calibers were successfully tested for bolt velocity verification.

Receiver marking drawings are being prepared for the designation of Model 4 and Model 6. Drawing transmittals will be made once location has been approved by Marketing.

Satisfactory production samples of the base grip cap have been made on a single cavity die.

Model 870 Competition Trap

Production of this new model still is being delayed pending completion of design modification testing. Three fore end tube design modifications have been tested.

The first design tested was the present production tube with the thread design changed to increase the area thru the threaded section by approximately 40%. The complete action bar is copper brazed together, microcarbed and heat treated. Using accelerated firing tests, one assembly went to 15,000 rounds with the tube failing next to the action bars. Two assemblies went to 25,000 rounds without failure. A slow rate of fire test was also conducted to determine if the rate of firing was a factor. Two assemblies went to 25,000 rounds without failure.

Model 870 Competition Trap Continued

The second design tested was the same as the first with the exception of a shock ring added to the test gun between the fore end nut and the gas cylinder. Using the accelerated firing test method one assembly went to 25,000 rounds without failure.

The third design tested was fore end tube of heavier wall thickness, copper brazed together, microcarbed and heat treated. Two assemblies went 25,000 rounds without failure under the accelerated mode of testing.

Test results indicated that the first design using the standard production tube is satisfactory. Process Engineering feels that for ease of assembly the heavier wall tube should be pursued.

During the intensive testing of the new fore end tube designs the premature cracking of the receiver was detected. Initial endurance testing of the prototype guns shows cracks developing at the rear of the ejection port at 32,000, 35,000 and 30,000 rounds. Cracking of receivers on production guns began to show after 5,000 rounds. Two Model 870 control guns went to 25,000 rounds without cracking the receivers.

To investigate the problem, strain analysis tests were conducted on the Model 870 Competition Trap gun receiver using CT barrels and a standard M870 barrel. Test results showed similar stress levels. Tests on a standard M870 receiver showed similar results.

Strain analysis measurements also were made using the same locking block in both the M870 Competition Trap shotgun and standard M870. The stress level results in both models proved to be the same.

Effects of a tight or loose magazine cap on the M870 Competition Trap and standard M870 are being evaluated. Preliminary results indicated that when the magazine cap is loosened one turn strain measurement reading is double. Two production guns are currently in test.

Bolt Action Carbine

Five barreled actions for each of four calibers will be ready for assembly the first week in March. The latch system on the floor plate has been redesigned to eliminate latch releasing during firing. A prototype model has been made and preliminary testing indicates satisfactory results. Additional prototype testing will be conducted.

Model 700 Bolt Lock

A number of bolt lock designs that provide the shooter with the ability to load and unload his rifle with the safety in the ON position have been developed. Four prototypes of different configuration have been fabricated. Design revisions are being made to improve aesthetics.

Process Research

Integral Ejector

Tooling modifications have been made to support the outside of the barrel to reduce the bulge in the area of the LT-20 ejector. Four prototype barrels have been fabricated for testing. A total of 60 round has been fired through each barrel. Testing has been curtailed due to higher priorities.

Rivetless Extractor

Satisfactory testing on the small caliber rivetless extractor without anti-rotation projection has been completed. Drawings are being finalized for transmittal to Production.

All tooling to coin anti-rotation projections into the M788 Regular, M700 Reg.L.H., M700 Mag. and M700 L.H. bolt heads will be completed in mid-March.

Auto Drill Line

The fabrication of the system is near completion. Vendor run-off is expected the first week in March. System installation and start-up at Ilion is estimated to be late April.

Other Work

New Owner Manual Format

The final draft version of the M700 Owner's Manual has been approved by Legal and Marketing Department. The draft will be reviewed with Smart Communications, Inc. and final artwork and printing completed.