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RESEARCH DEPARTMENT

THIRD QUARTER PROGRESS REPORT - 1980

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REMINGTON ARMS COMPANY

RESEARCH AND DEVELOPMENT

THIRD QUARTER PROGRESS REPORT - 1980

HIGHLIGHTS

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|---|-------------|
| • Extended semiworks runs of the new unibody process were successfully completed on 12 gauge products. The bodies are now being processed through assemble, head and prime at Lonoke, and load development has been started. Semiworks equipment has been upgraded, and the production prototype unit is on schedule. | 1 |
| • 21MM Seismic product produced in the semiworks is being warehoused at the rate of 50,000 rounds per month. This schedule will continue through September and October. Component banks are being built in preparation for startup of production facilities in November at a rate of 250,000 rounds per month. | 1 |
| • Laboratory quantities of 20 gauge steel shot loads were prepared and shipped to the U.S. Fish and Wildlife Service for proposed field tests. | 2 |
| • A research program was initiated to design and develop a progressive center fire shell draw process. Prototype facilities will be installed in February, 1981. | 2 |
| • Equipment for producing integral anvil battery cups was installed at Lonoke. Performance demonstration will begin upon receipt of spare tooling. | 3 |
| • Further testing of rim fire TLX priming mixtures continues to show encouraging results. Testing of TLX in shotshell primers will begin October 1, 1980. | 3 |

REMINGTON ARMS COMPANY
RESEARCH AND DEVELOPMENT
THIRD QUARTER PROGRESS REPORT - 1980

AMMUNITION

New Unibody Shotshell Process

The improved one-piece plastic shotshell body process being developed will be capable of producing the complete range of shotshell specifications and is expected to result in an annual cost reduction of about \$1,000,000.

An extended run of 100,000 12 gauge bodies, in both 2-3/4" and 3" lengths, was completed at a machine rate of 80 parts per minute. Frequent monitoring of product dimensions during the run revealed no dimensional drifts, indicating a stable process. Bodies were sent to both the Bridgeport and Lonoke Plant for assembly and loading. The 2-3/4" bodies sent to Lonoke have been processed as both high and low base loads through the assemble, head and prime equipment. Load development is now in progress. Since it is proposed that a single 12 gauge body will replace three of the present bodies (RXP® type, 45 grain dry molded basewad, and 58 grain dry molded basewad), POWER PISTON® wad fit problems are anticipated. Preliminary load development results suggest existing wad designs can be used for 1-1/8 ounce and heavier loads, but a new design may be required for the one ounce load.

The semiworks equipment is in the final stages of upgrading to more closely simulate the proposed production equipment. A new die set and cam have been installed and are ready for check-out prior to resuming product development work in October.

The production prototype system under development is being designed to produce shotshell bodies at a rate of 960 parts per minute. This will provide a system capacity of 220MM components annually. In this work, all design work is complete and orders have been placed for the body former; redesign of the heatset equipment, incorporating improvements determined necessary by semiworks testing, is scheduled for completion in September with order placement expected in October; and, design work is complete on the control system and orders have been placed. Production start-up of the prototype system is scheduled for mid-1981.

214M Seismic

An electrically fired cartridge and gun system is being developed for MAFCO for seismographic work and is designated as the

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September 1980

21MM Seismic (Cont'd.)

21MM Seismic Shell. The shell requires an electric primer being developed and produced at Bridgeport, and a compatible gun and firing system being proven at Ilion.

Ammunition production rates have been improving and are currently limited by the dry assembly rate of about 5000 assemblies per day. In July, a total of 70,000 loaded rounds were warehoused and a run of 115,000 primers was completed. These primers will be assembled into bodies and loaded for the September and October commitments of 50,000 rounds each month. There are currently 47,000 rounds in the warehouse.

It is presently planned to begin producing 250,000 rounds per month in November. The first samples of support cups, buttons and primer cups are due from the vendor on October 1st. Product costs were calculated based upon the proposed production process and full book costs range from \$495/M to \$517/M depending upon the outputs achieved from the assembly and charging booth. Comparable costs for the standard 8 gauge product are \$440/M. A technical data package is being prepared which will specify raw materials, tooling, product and process specifications and recommended quality control procedures. It is expected that this will be completed about November 1st when production operations are initiated on the new equipment.

20 Gauge Magnum Steel Shot Loads

In support of a proposed field testing program, the Fish and Wildlife Service, U.S. Department of Interior, requested that Remington provide 5500 rounds of steel loads and an equal number of lead loads for a test control. The steel loads were prepared in the Research semiworks facility and both types of ammunition, along with 12 Model 1100 LT-20 magnum shotguns (specially prepared with double gas ports for reliable function with the experimental steel loads) were shipped to the Tulalake National Wildlife Refuge on September 15, 1980. No further work on steel load development is anticipated at this time.

C.F. Ammunition - Progressive Shell Draw Development

Work is underway to develop an improved process for manufacturing center fire ammunition cases and bullet jackets. The proposed new process is based on progressive forming of components from cup to final draw length in a continuous operation on one machine without the customary interdraw anneals.

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September 1980

C.F. Ammunition - Progressive Shell Draw Development (Cont'd.)

The plan is to have all hardware ready for initial testing in February, 1981. The primary development goals are to establish progressive draw feasibility, define equipment speed and efficiency, determine lubrication requirements and tool usage, and provide a data base to assist in further tooling development. This work is proceeding on schedule.

Integral Anvil Battery Cup

The objective of this program is to develop an integral anvil battery cup to reduce primer manufacturing costs, improve consistency of primer quality, and provide greater opportunity for process automation.

The die was successfully tested in June with approximately 830,000 components being made. The system was shipped to Remington in July. It has since been received and installed. Five anvil support punches were broken due to a misfeed during start-up. One coil of metal has been passed through the system at design speed without these punches to gain operating experience and finalize safety requirements. Upon receipt of spare tooling, the performance demonstration, (production of twenty-five million parts) will begin.

Preliminary supporting documentation necessary for proper operation of this equipment is complete. A Process Record describing component, material and lubricant specifications, the tooling progression and gauges for product acceptance, die set-up, and material inspection has been prepared. A Technical Data Pack containing vendor catalogues, reproducible engineering drawings, a spare parts list, and operating manual was also assembled.

Hand operated equipment for covering the flash holes has been satisfactorily tested at thirty parts/minute. The paper covering concept requires only one tooling station and has been forwarded to Legal for comment on patentability or infringement.

TLX Priming Mixtures

The purpose of this program is to improve primer manufacturing safety by developing a priming mixture which is significantly less sensitive to detonation during manufacture.

The proposed TLX mixture contains nitrocellulose to take up excess moisture and improve charging characteristics. Using 4% nitrocellulose and an increased mixing time, the rim fire mixture has passed all product evaluation tests to date. Drop tests,

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September 1980

TLX Priming Mixtures (Cont'd.)

ballistics and accuracy results were comparable to the standard control mixture and the candidate mixture indicated acceptable compatibility with the high speed rim fire shell inspection machine. A total of 27,500 rounds have been fired in pistols and rifles with no misfires or malfunctions. After 11 weeks under high humidity, hot storage conditions, the candidate mixture held up well showing less misfires than the control. The mixture has been tested under mass detonation conditions and was found to be insensitive to #8 blasting cap detonations at various stages of the mixing cycle. A plant scale run of the rim fire candidate mixture is scheduled for the week ending October 3, 1980, with more extensive testing to follow.

In order to test the candidate mixture in shotshell primers, a new, 1.1 grain pellet weight charging plate has been purchased and experimental work in this area will commence October 1, 1980.

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September 1980

STATUS PRODUCT DEVELOPMENT

Polymer Improvement

Shotshell body cutoffs on reloading have been reported in the field. The primary cause has been traced to the body polymer. To correct the problem, a program was initiated to correlate specific polymer characteristics with the severity of shotshell body cutoffs, and to identify acceptable alternative resins. The first to be evaluated, Chemplex 2203, processed well through the extruder and gave high tensiles in finished product. However, it produced an unacceptable level of body defects going through the body forming operation. In response to this, Chemplex provided three experimental samples of polymer with different levels of internal lubricant. These could not effectively be processed through extrusion. Two additional samples from Chemplex, one of slightly lower density and one produced with a different catalyst are yet to be tried, along with two samples from USI and one sample from Marlex.

30 Caliber "Accelerator" Sabots

Due to the problem of excessive sprue lengths on molded polycarbonate sabots, the use of Lexan® 141 is being considered as a direct replacement for Lexan® 191. During an experimental molding run at the vendor's plant, this polyethylene-free material totally eliminated the excess sprue lengths on molded product. To determine the compatibility of this resin with the single base powder (DuPont 4198) used in the 30 cal. "Accelerator" products, severe long-term environmental testing was initiated. Results obtained mid-way through the six-month storage period continue to show positive indications of compatibility with the powder. The final series of tests, after six months storage at 150°F, are scheduled on November 21, 1980.

357 Remington Maximum 158 Gr. SJHP

Case splits resulted when 357 Rem. Max primed shells, made from standard 357 magnum components, were loaded to 50,000 psi and fired in a prototype Ruger handgun. These cases have performed satisfactorily in UK barrels and their wall thickness variation is within 357 magnum specification. The handgun chamber dimensions plug-gauge satisfactorily. Further examination of these cases is in progress.

A second experimental run has been initiated to produce cases from shells made in a three-draw process. These cases will have a wall geometry identical to those that split. Plans for a third experimental run to produce a heavier walled shell are being made.

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September 1980

7mm BR Remington Case

Second and third taper dies, due mid-October, are on the critical path for conducting an experimental run in November. All other tools are on hand. Two samples of shells, each based on a different draw process, are being made on production equipment.

7mm Mauser 140 Gr. PSP

An experimental run, using commercial bullets identical to those currently loaded in 7mm-08, was conducted with satisfactory results. Efforts to procure bullets and packaging materials for a December production run are in progress.

117 Primer

Testing of the 117 has shown that it is acceptable for use in the nitro mag and steel loads and possibly all other field loads. With respect to the target loads, recent testing indicates that the level of sensitivity, particularly off-center, with the proposed primer is not satisfactory. A program that does not involve major changes to the primer has been developed to accomplish the required improvement in sensitivity for these loads. This program, involving reduction in the metal hardness and/or thickness of the primer cup, will be complete by November, 1960, when a schedule for production implementation can be detailed.

STATUS - PROCESS DEVELOPMENT

3" 12 Gauge RXP® Shotshell

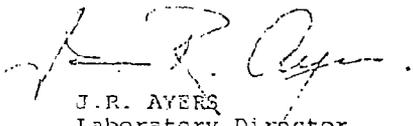
It was demonstrated that with tool modifications and press adjustments 2-3/4" product slugs could be successfully processed into 3" bodies at full speed using one row of modified tooling. These bodies were assembled, headed and primed with only minor equipment adjustments, and a portion were production loaded (SP12HMAG-00BK) with no difficulties encountered. Product acceptance testing was completed and the ammunition met all performance criteria. Additional tooling is now being fabricated for the remaining rows of the press. Upon receipt, a trial and pilot/production run will be scheduled by the Bridgeport Plant.

Asbestos Basewad Elimination

The purpose of this project is to eliminate the asbestos dry molded basewad from Remington's complete line of "5P" shotshell products by conversion to a high density polyethylene material.

At Bridgeport, all gauges, with the exception of 8 and 10, have been converted to plastic and are in production. Work on 8 gauge conversion is presently underway.

In August, an attempt was made to extrude and cut off 8 gauge plastic basewad slugs. Extruder instability problems, possibly caused by the heavy wall of the rod, allowed only a negligible portion of the extrudate to be maintained within dimensional specifications. However, some of the acceptable product was cut to slug length and hand assembled, headed and primed in the Research semiworks facility. These shells will be production loaded and product acceptance tested on a preliminary basis before further work is done on improving the extrusion process.


J.R. AYERS
Laboratory Director
Ammunition Research

JRA:mf

Research Department

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September 1980

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REMINGTON ARMS COMPANY, INC.

RESEARCH AND DEVELOPMENT - FIREARMS

THIRD QUARTER PROGRESS REPORT - 1980

September 23, 1980

HIGHLIGHTS

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<u>New Product Development</u>	
o Warehouse quality audits are in progress on the M7400, M7600, M4 and M6 center fire rifles. Audit results will be available by mid-October.	3
o Revisions to the M870 Competition Trap shotgun gas piston, barrel support, and locking block have been successfully test fired to 25,000 rounds. Design drawings have been transmitted to Process Engineering.	3
o Component parts for two new locking systems and action bar assemblies for the XSG shotgun are in process. Assembly and testing should resume by mid-October.	4
o Delay fire and high misfire rate problems with the Model 979 Seismic Gun have been solved and the first lot of 15 guns has been shipped to MAPCO.	4
o Prototypes of the bolt action carbine were provided to Marketing for field testing. Results indicate that the gun was well accepted, but needs some weight reduction.	5
o New format Owner's Instruction Manual for the M7400/7600 and M4/6 rifles has been completed and released to Production.	5

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Current Product Development

Page

- o Cost savings of \$84.3M per year will be realized by introduction of the rivetless extractor in the M7400/7600 center fire rifles. These extractors have been approved for production and introduction should be completed by the end of October. 5
- o Cost savings of \$60M per year will be realized by introduction of the integral ejector design to the M1100 12 Ga., 16 Ga. and 20 Ga. shotguns. Testing of M1100 LT-20 barrels has been completed and the design approved for production. 6
- o An aesthetically acceptable design of a bolt lock separate from the safety on the M700 rifle has been completed and is scheduled for testing in October. 6
- o Test models of the M788 rifle incorporating an improved safety button design are being fabricated. 7

Process Development

- o The Auto-Drill line is now under power and full automatic operation is scheduled for October 10. The saw and south lathe have been cycled automatically and final adjustments and lube modifications are in progress. 8
- o Savings of \$61M at a 23% ROI will be realized with ASEA Manipulator polishing of M7400/7600 receivers. The Shaevitz LVDT repositioning system to overcome tolerance problems in receiver panel polishing is due September 30. 9
- o Delivery of the wire electrical discharge machine for the Four Slide Machine is expected by October 15. M7400/7600 long magazine followers have been selected as the first parts to be formed. 9
- o Metallurgically sound laser welds of 1018 steel slide blocks to action bars have been obtained by ETL. However, adequate weld strength has not been achieved. 10

STATUS - New Product Development

Model 7400 Autoloading and Model 7600 Slide Action Center Fire Rifles

These rifles have been developed as replacements for the current Model 742 and Model 760 and are scheduled for announcement in December 1980.

Warehouse quality audits are in progress on the M7400, M7600, M4 and M6 rifles. Visual audits and functional tests will be performed and results available by mid-October.

M7400 guns have been withdrawn from the warehouse for the sports writers' seminar. Five guns have been scoped and accuracy is within specifications.

The Limited Edition Model Four is being prepared for release to production. Completed artwork will be ready for review by the end of September. Sample guns will be ready by mid-October 1980 for product acceptance.

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. The gun was previewed at the Grand American Handicap Trap Shoot in August 1979 and announced in December 1979. During initial trial and pilot testing, problems were encountered with vent ribs and magazine caps becoming loose during test. Design revisions were required.

Revisions involved addition of a buffer on the piston, a barrel support to retain the barrel, and a shot peened locking block. The latest design of the gun has been successfully tested to 25,000 rounds and drawings have been transmitted to Process Engineering. Updated costs show no significant change. We are working with production to improve warehouse dates. Presently we are drilling barrel support and gas cylinder positioning holes in barrels.

XSG/SPG Shotgun

New autoloading (XSG) and slide action (XPG) shotguns are being developed. The objective of the program is to replace the Model 1100 autoloading shotgun and the Model 870 slide action shotgun with improved versions which will be lighter in weight. The guns are being designed simultaneously to take advantage of common parts for reduced manufacturing costs.

The two new locking systems are near completion. Component parts are in heat treat. Assembly and test will begin in mid-October. Action bar assemblies are now being heat treated and testing will resume on the new round and square wire action springs.

Layouts and detail drawings are being prepared for the XPG. A new feed system is in the layout stage. The system is designed to work in both XSG and XPG shotguns.

Four new XSG prototypes are scheduled for assembly in December for design verification.

Model 979 Seismic Gun

The first lot of 15 Model 979 Seismic guns has been shipped to MAPCO. The next lot of 25 guns will be completed by October 7, 1980 and will be shipped in small lots of 5 to 10 as soon as they are available.

The first fifteen guns were delayed approximately six weeks due to a "delay fire" phenomenon and a high misfire rate in multiple firing from a single source. These problems were solved by changing ammunition lots in the case of the "delay fire" and by adding a resistor in series with each gun for the parallel fire mode. The "delay fire" phenomenon was discovered to be a misfire which fired on a second pulse generated by the firing system.

There were two guns returned to us on September 12, 1980, one for bad ejection and the other due to a blanked primer. The one that had the bad ejection was found to be excessively dirty; when cleaned ejection returned to normal. The one that had a blanked primer was damaged but repairable. The fired shell showed signs of extremely high pressure; the cap was bulged into the ejector and the body was partially missing. Damaged parts in the gun were replaced and the gun is now serviceable.

There was no injury to personnel and no parts or debris left the gun when the blanked primer was encountered.

Bolt Action Carbine

The carbine is a short barreled, bolt action center fire rifle that is being developed as a replacement for the Model 600.

Prototype models were provided to Marketing for field testing. Results indicate that the rifle was well accepted, but needs some weight reduction.

Marketing requested that we investigate ways to reduce the overall weight of the rifle. A list has been compiled of the options. A meeting will be held in October with Marketing to define model requirements.

New Owner's Manual Format

Our present Owner's Manuals contain words that are often technically slanted, making it difficult for the average person to read and understand. New manuals are being prepared using a controlled language with the key principle being one word-one meaning.

Instruction books for the Models 7400, 7600, Four, and Six have been completed and released to Production.

Mechanical illustrations for the Model 700 standard and classic grades have been completed. Instruction books are scheduled to be printed and ready for packaging October 15, 1980. Mechanical illustrations for the Model 700 Left Hand are scheduled to be completed October 1st.

Draft of the text for the Model 870 Competition Trap instruction book has been completed for reviewing. Work is proceeding to complete camera copies for proof printing.

STATUS - Current Product Development

Rivetless Extractor

Cost savings of \$84.3M per year will be realized by introduction of the rivetless extractor in the M7400/7600 center fire rifles. These new extractors in small, regular and magnum sizes will replace the troublesome riveted types. Part cost will be reduced, a number of

bolt head operations eliminated, and gun reliability and ease of replacement will be improved.

All three extractor sizes have been extensively tested and approved for introduction in all center fire rifles. Regular and magnum extractors require an anti-rotation projection in their respective bolt heads to prevent them from rotating out of position. Tooling to coin the anti-rotation projections in all center fire bolt heads has been designed and built. Some of the tooling is already being used for production. Trial of the remainder should be completed by the end of October.

Integral Ejectors

Currently the ejectors in the Model 1100 12 Ga. and 20 Ga. shotguns are spot welded to the barrel extension and machined to size. A process has been developed to form the ejector as an integral part of the barrel extension. Use of an integral ejector will eliminate three process operations, as well as the ejector pin, and will result in a more durable ejection system. Tooling to coin ejection surfaces into 12 Ga., 16 Ga. and standard 20 Ga. barrels has been developed and transmitted to Production. Savings of over \$60M per year can be realized by this procedure.

Field and endurance testing of M1100 LT-20 barrels has now been completed. No ejection problems were encountered and ejection surfaces showed negligible wear. Drawings are being prepared for transmittal and tooling for coining the integral ejectors has been turned over to Production.

Model 700 Bolt Lock and Fire Control

New bolt lock and fire control designs for the 700 bolt action center fire rifle are being developed as part of an ongoing program to improve the functional characteristics of our current firearms line.

The objective of the bolt lock program is to give the shooter the ability to open and unload his firearm with the safety in the ON position. To do this, the bolt lock and safety on the M700 rifle have been designed to operate independently of each other. A lever that is aesthetically acceptable has been designed and is scheduled for testing by the end of October. New cost estimates are being prepared by Industrial Engineering.

To date four fire controls have been designed and are in various stages of assembly. New components for the original (No. 1) design have been fabricated, assembled and evaluated. Sear engagement, trigger pull and operating forces have all been satisfactory. However, safety operation has been unreliable. The safety fails, at times, to support the sear as intended. A method of insuring engagement, possibly the use of interlocking angles, would solve this problem.

Tolerance problems, along with sear safety engagement in Design No. 2, have been eliminated. Another area of concern is that of sear return after firing. Replacement of the sear spring should solve that problem. A new spring has been designed and fabricated. Assembly and testing is planned for the first of October.

The third design has been fabricated and assembled. Initial tests indicate proper functionality. Further testing is planned.

Design No. 4 is being fabricated and will be assembled and tested the second week in October. This fire control features a blocked sear as well as a blocked trigger, and is intended to be used with the new bolt lock.

Model 788 Safety

The present Model 788 rifle has been in the line for several years. A continuing effort is made to improve operation of the current firearms line in conjunction with reports from Production, Process and the field.

Experience indicated that the safety button could be contacted by the first web space of the hand when holding the gun by the grip of the stock and resting the gun on the shoulder. This could possibly cause the safety to be moved to the off safe position. The safety button has been redesigned to correct this condition. Drawings have been forwarded to our vendor to investigate manufacturing problems. Reports are satisfactory to date.

The force to move the safety to the off safe position is on the light side. The detent and detent spring have been redesigned to increase the off safe force. Preliminary models have been tested satisfactorily.

Models incorporating the new safety button, detent hole, detent, and detent spring are being fabricated for final testing and should be ready for assembly in October.

Model 1100 Ducks Unlimited Shotgun

The Ducks Unlimited program consists of special model shotguns that are sold to the Ducks Unlimited Organization which auctions them off at a fall dinner meeting to raise money for their organization. Marketing has developed, in conjunction with Ducks Unlimited, a four year program with an option for the fifth year, where Remington will furnish these special shotguns in limited quantities.

The program consists of three special production shotguns each year. The first year there will be a Commemorative Model 1100 - 12 Ga. Dinner Gun, a secondary M1100 LT20 Dinner Gun, and a M1100 - 12 Ga. trade gun.

We have provided Marketing with preliminary models of the Commemorative and Secondary dinner guns. Using these models and preliminary artwork furnished by Marketing, Ducks Unlimited agreed to the first year model requirements for all three models.

Drawings will be transmitted to Process Engineering in October 1980. Hand engraved models with the final agreed upon artwork will be completed in October.

STATUS - Process Development

Auto-Drill Line

The present method of preparing shotgun barrel blanks for the swaging machine is difficult to control and requires an unacceptably high degree of technical and engineering support. A new drill line utilizing proven machining methods and completely automatic part handling has been developed to replace the present system.

The complete line is now under power. The saw and the south lathe have been cycled fully automatically cutting steel. The installation of the smoke system ductwork is nearly complete and final adjustments are in progress. Bearing and lubrication revisions will be performed by the vendor starting September 29. All work is scheduled for completion by October 10, with the line in fully automatic operation at that time.

ASEA Manipulator

Rifle and shotgun receivers are rough and finish polished by a labor intensive hand process. ASEA, Inc., an industrial manipulator manufacturer, demonstrated the technical capability of automatically polishing Model 742 and Model 760 receivers utilizing their industrial robot.

Updated economics on this project now reflect a savings of \$61M per year at a 23% ROI for completely polishing the Model 7400 and 7600 receivers. An adequately uniform finish has been achieved on the radii. Flat polishing tolerance problems will be solved by adapting the feedback of a Shaevitz LVDT repositioning system into the manipulator programming. The LVDT is due on September 30.

Additional investigation into M870 polishing will be conducted by Research, while improved panel polishing will be reviewed in conjunction with ESD.

The system will be available for limited manual load production on the M7400/7600 during the first half of 1981.

Four Slide Machine

This automatic manufacturing for in-house production of precision formed stampings will enable Remington to develop an expertise in stamping manufacture required to eliminate our total dependence on costly outside suppliers. Additional benefits will be improved quality and reduced new product lead times.

Support equipment will include a wire electrical discharge machine (EDM) which will be used to manufacture four-slide tooling and prototype gun parts. Delivery of the wire EDM is expected by mid-October. Because of the complexity and size of the first parts chosen for manufacture, M7400/7600 long magazine followers, some additional attachments have been ordered for the four-slide machine. Equipped with these additional items, the machine will be more versatile and will enable us to manufacture more complex formed stampings than originally contemplated.

Laser Welding

Model 1100 and Model 870 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.

Metallurgically sound laser welds of 1018 steel slide blocks to action bars have been obtained by ETL. However, adequate weld strength has not been achieved. ETL will continue to experiment, using different laser welding techniques, until satisfactory weld strength has been achieved.

Laser Wood Carving

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.

Marketing has approved a laser engraved emblem for the M1100 LT-20 Ducks Unlimited shotgun stock. Artwork has been sent to Lasermation for sample preparation.