

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



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December 29, 1988

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FROM: W. H. Coleman, II

ILION R & D AND TECHNICAL
MONTHLY REPORTS
DECEMBER 1988

Constructive suggestions, ideas and criticism are welcomed by all
report contributors.

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Ilion, New York
December 29, 1988

TO: W. H. COLEMAN, II

FROM: L. B. BOSQUET/T. C. DOUGLAS *LB*

NEW PRODUCTS DEVELOPMENT MONTHLY REPORT - DECEMBER

CURRENT PRODUCTS

EKSTROM-CARLSON CHECKERING MACHINE - Monteau/Hickey

The "EDIT EKSTROM" and "INSERT CHECKER" routines are working and we are able to program the Ekstrom - Carlson checkering machine. There are still a few remaining "bugs" to be worked out, such as, the elimination of some extraneous motion in the rotary axis when it is directed to return to zero. This and other minor problem areas are being worked on and do not interfere with operating the equipment.

Trial and pilot stocks and fore-ends for the SP-10MAG have been successfully run over this equipment. The Model 11-87 fore-end has been reprogrammed and the problem with the side sections being shifted radially has been resolved. Still to be completed in the software is the capability to create unchecked "islands" within a pattern.

The work being done with Air Turbine Technology has begun to pay-off. The excessive noise level associated with the cutter motors was thought to be caused by improper balancing in the air motors. Several motors were sent to the vendor for repair and rebalancing. On their return to Remington in early December, six were installed in the machine. The noise problem appears to have been resolved. Performance is being monitored to see if there is an associated increase in motor life as the result of this work. It is felt that premature bearing failure could also be related to improper balancing.

To further reduce the decibel level at the operator's position, enclosures will be built around each of the cutting heads as soon as the air counter-balance system has been installed. The counterbalance system will replace the springs which support each head.

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EKSTROM-CARLSON CHECKERING MACHINE - (cont'd.)

In anticipation of the need for additional checkering capacity in the future, information has been supplied to Industrial Engineering for evaluation and preparation of a project. An estimated capital requirement has been put into the 1989 forecast.

It now appears that Allen-Bradley will supply the information necessary to edit the PAL (Programmable Application Logic) so that the A and B drives can be separated. Remington personnel will actually make the changes. We are also investigating the replacement of the Allen-Bradley 7320 controller with a new 8600 controller which is used on the new Ekstrom-Carlson machines. This would essentially make both machines identical for programming, operation and service. In anticipation that this will take place around mid-year, additional fixturing has been ordered for both the Model 870 and 11-87 stocks and fore-ends.

REMINGTON BARREL FOR THE SNIPER WEAPON SYSTEM - Martin

Three rifles made from the first mandrel and three rifles made from the second mandrel have been tested. The average mean radius of the three barrels from mandrel #2 was 1.148 inches versus the accuracy specification of 1.3 inches. The first 103 production rifles had an average mean radius of 1.021 inches. One of the rifles from mandrel #2 is being shot 5000 rounds to check barrel life. That rifle is currently at the 500+ round level. A third mandrel has been ordered which has 5 conventional lands and grooves versus the radiused configuration.

MULTI-HEAD CHECKERING SOFTWARE - Monteau/Hickey

American Bay Limited is continuing their work on converting the NC checkering software from the GE 4020 format to our Compaq 386 PDs. Bob Turner has begun the process of refining and debugging sub-routines. He has also started interconnecting the various sub-routines which will make it less cumbersome and time consuming to program a checkering pattern.

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MULTI-HEAD CHECKERING IMPROVEMENTS - Monteau

The "Z" and "TILT" drive units are being revised to provide more dependable operation and easier maintenance. Components needed to change the "TILT" drive from a chain belt no longer available to a standard timing belt have been received. It has been determined that a special length belt will be required for the "Z" drive and will be ordered. Delivery will be approximately three months after receipt of an order. Some design work is required.

TOOL DESIGN - Monteau

The project to replace the Bruning Model 870 print machine with a non-ammonia type whiteline printer has been approved (122258). A Bruning Model PD778 will be placed on order in January. In addition to eliminating the use of anhydrous ammonia, this machine does not require an exhaust, uses our current print paper and uses less electricity because it does not have to run continuously. All of these reasons make this an attractive proposal. It is anticipated that the project will be completed in April.

The Hewlett-Packard plotter in the Tool Design area currently handles drawings up to 48" in length. Occasionally it is necessary to handle much longer formats and steps are being taken to provide this ability.

FMS MODELING - Findlay

Modeling and detailing are complete for the LT-20 receiver for FMS manufacture. Advance drawings of the part were turned over to Bob Orf for review by his group. Upon approval, transmittal of the drawing will take place.

M/11-87/1100 FORE-END SUPPORT - Powers

Prototype tooling for the redesigned fore-end support intended to replace our current fore-end/barrel support has been corrected and the remainder of the prototype run has been received. Testing will be scheduled with the stainless maraging steel alternate choke tube material. Testing should begin the third week in January.

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NEW PRODUCTS - 1988 CATALOG

PARKER - Murphy

The primary effort in the previous month was again directed towards building prototypes for test. Highlights of last months activity are as follows:

- o The seven test guns have all been color case heat treated with the last four frames showing a minimum of distortion. Five of the frames are at Kolar for final fitting and assembly, one will be returned today and one has been stocked and is ready to be proofed and shot. This first complete gun is exhibiting ejection problems that Don Mainland assures me were not there before the gun was stocked so I recommend that we proof the gun today and return it to Kolar to be corrected before we begin function testing. A formal report on the barrel assembly x-ray inspection procedure is still expected from Fred Schmidt.
- o The stock drilling fixture has been designed by Tim McCormack and Kolar and is being fabricated.
- o Don Mainland is interested in purchasing some older Remington equipment to facilitate the manufacture of production Parkers. I have assembled a list of available equipment and Don is assessing his needs. I expect a visit from Don sometime during our testing of the Parker prototypes to conclude this business. Rather than have Remington ship our equipment to Kolar, this time I envision selling any equipment outright. This is a business decision that needs to be addressed.

At an early Parker meeting here in Ilion, Remington promised to Kolar the use of unused M/3200 equipment. In conversation, Don Mainland has often mentioned our failure to meet this commitment. Since other business needs have claimed the majority of this equipment we need to find another way to fulfill this obligation.

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- o It has been difficult to prepare the Test Lab for work on the Parker particularly without the ability to significantly influence the efforts of Kolar. From what I was told I expected all of the new Parkers would be in test before the holidays. Since they are not here, and the SP-10 Mag. testing is due to begin in mid-January, there will be a conflict in the test lab that we need to prepare for.
- o Legal and/or Quality Control input is needed to determine what Kolar and Remington needs are regarding process records, inspection, etc. I will schedule a meeting to resolve this issue.
- o The first draft of the Parker manual has been done and I am still waiting for approval from Jim Hutton and Ken Green.

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NEW PRODUCTS - 1989 CATALOG

SP-10 MAGNUM - Rowlands/Bauman/Lewis/Verdura/Murphy

An SP-10 MAG. with a 26" barrel was sent to marketing for a TV Promotional. The gun performed flawlessly during the show when shot with Rem. 1 3/4 oz. steel BB's. However, during prior testing using Rem. 1 3/4 oz. steel 3's the same gun malfunctioned repeatedly because of apparent power problems. This information has been relayed to Lonoke.

An SP-10 MAG. and an Ithaca MAG-10, both with 26" barrels, have been sent to Lonoke so that future 10 Ga. ammo development work can be conducted with barrels that produce minimum blow-back assistance. Previously, Ithaca MAG-10's with 32" barrels had been used.

The four guns sent to St. Louis were field tested by Consol management personnel with encouraging results. Some of the participants liked the guns so much they will be placing purchase orders. They have requested that they be allowed to hold on to the guns for additional field testing.

Vestshell technical personnel have requested some minor modifications to the drawing dimensions of some of the investment castings they produce for us. In addition they indicate that some of the old Ithaca tooling is worn out and will need replacing after the first year's production run. This will allow us to incorporate some features into the castings that are currently machining operations.

Three 10 Ga. choke tubes have now been accepted. Two are for use with Steel and Lead shot and will be dual marked to indicate their respective constrictions. The third choke tube will be for use with Lead shot only and will be marked "Turkey X-Full/Lead Shot Only". A new choke tube wrench has been designed which incorporates an integral pilot and a 3/8ths square hole for use with a ratchet wrench.

Development alterations are being removed from drawings so that formal transmittal can begin. The CV drawings will be worked on first. The owners manual is also being worked on.

Final parts have been received from the model shop for the alternate feed system design and it has been assembled. Alterations to the carrier have been made to eliminate an intermittent trap shell condition. Layout work has been done to determine the extent of the modifications required to prevent the shell from the magazine interfering with the extracting shell. This redesign work is complete and new extractors have been made by the model shop. Initial testing indicates a timing problem with the feeding shell.

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SP-10 MAGNUM - (cont'd.)

There are several process records which have not been issued as tool design has not been completed. As soon as the remaining tool numbers become available, they will be completed and issued.

The trial and pilot stocks and fore-ends have been completed and are ready for final assembly.

Approximately four-hundred (400) barrels have been processed thru the turn operation. The last of the tooling needed for the chambering operation was received December 27th, inspected and accepted on the 30th. Arrangements have been made with production to set-up and chamber the barrels on January 3rd or 4th.

Problems have been encountered in getting the K&T machining center up and running. A factory man is scheduled to be here January 3rd. Fixtures, tooling, programming and parts are at the machine to run the barrel extension and gas piston lugs. Both of these parts will be needed around January 11th in order to keep the barrel trial and pilot moving. Each part requires about twenty-two minutes per pallet to machine. To complete the machining of the trial and pilot parts will take two weeks on a single shift basis. If an additional operator or technician could be trained to run the equipment, these parts could be ready at about the same time that the barrels will be ready for them. The vent ribs (twenty-six and thirty inch) have been completed.

Slides have been completely machined and are ready for heat treatment. It is anticipated that they will be ready for slide assembly operations the week of January ninth.

Trial and pilot of the breech bolts has stalled at a miscellaneous drilling operation. The Tool Room is still waiting for the drill bushings needed to complete the drill jig.

Receivers are being run through the stand-alone T-10 and should be ready for the top radius group the week of January third. The run-off of the receiver tooling and programming at K&T is overdue. They will be contacted for the status following the holidays. Completion of the receivers should take about one and one-half to two weeks following the K&T operations.

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SP-10 MAGNUM - (cont'd.)

The trigger plate program is being debugged and parts should be in process the week of January third. As soon as parts are being run, the program will be expanded to machine three parts per loading. All remaining parts for the trigger plate assembly have been completed except for the carrier. Tooling alterations to accommodate the offset have to be completed. The Tool Room is having the tooling revised on the outside.

Slide extension assemblies have been started, however, the trial and pilot lot of three-hundred forty-one slide extension prongs has been lost. It may be necessary to use available Ithaca castings if the trial and pilot parts cannot be found. A decision will have to be made by January fourth or fifth as the locators on a braze fixture will have to be modified if the Ithaca parts are used.

The maraging steel for the choke tubes still has not been received and until it has been, Purchasing will not place an order for parts. A check made right after Christmas indicated that the material should be on the plant the week of January third. Additional material should be placed on order as this is the same material that is used for the 12 gauge steel shot and 12 gauge rifled choke tubes.

TURKEY CHOKE TUBE - Murphy/Powers

An identical tube, with the exception of a straight taper instead of a parabolic taper, and a vendor production tube, were tested for pattern evaluation. Preliminary results indicate the straight taper tube performs as well as the parabolic tube. Additional samples have been tested for design acceptance to replace the current design. The Design Acceptance report is being written for review and transmittal.

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SLUG GUN SYSTEM - D.Findlay/Lewis/Verdura

Item masters and product structures have been completed. Process records will be written as soon as tool design has been completed and tool numbers are available.

The first production run of this product is scheduled for April. There are an estimated 5000 hours of tool design and build required to add this to the product line. In order to provide sufficient time for build, all tool design must be completed by the end of January and, for this reason, is being done under contract with two design firms.

The project has been approved. Requisitions have been issued for all purchased components in quantities sufficient to build three-hundred of each model for the trial and pilot.

A study issued October 14, 1988 showed the burdening of the machine which counterbores and taps the barrels for choke tubes to be:

- o 5 day - 3 shifts - 137%
- o 6 days - 3 shifts (w/overtime) - 125%
- o 7 days - 3 shifts (w/overtime) - 119%
- o 7 day operation w/swing shifts - 98%

With this in mind, quotations were requested for an additional machine. It is anticipated that (if the burdening remains as it was projected in October) an order will be placed by the middle of January. Delivery has been quoted at forty-two to forty-four weeks. This means that if the order were to be placed on January third, the machine would not be available until the end of October or early November (not in time for 1989 production).

MODEL 700 AS BDL (ARYLON STOCK) - VERDURA, LEWIS

In 1989 Remington will offer the Model 700 BDL fitted with a stock made of DuPont Arylon. This will mark the first time that Arylon has been used as a viable material for a gun stock. This version of the Model 700 will replace the Rynite and right hand fiberglass stocks currently in the product line. It will be produced in long and short action versions as well as in regular, magnum and varmint barrel configurations in the following calibers:

- o 22-250 REM
- o 243 WIN
- o 270 WIN
- o 30-06 SPFD
- o 308 WIN
- o 7mm REM MAG
- o 280 REM

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MODEL 700 AS BDL (ARYLON STOCK) - (cont'd.)

The initial lot of two-hundred stocks has been received and inspected. The results of the inspection were reviewed with F.H.Smith and the lot was accepted. Initial production is scheduled for February 1989 in 22-250 REM caliber.

A formal trial and pilot is not required on this item but the Test and Measurement Lab may want to draw a sample from the first production run and verify that it conforms to Model 700 specifications.

End label information has been entered into the WICS system. Item masters and product structures are complete. Process records will be ready to issue by the end of the month.

MODEL 700 CLASSIC .300 WEATHERBY MAGNUM - Lewis/Verdura

The 1989 offering in the Model 700 Classic series will be the 300 Weatherby Magnum. This will be a synergistic offering from both Firearms and Ammunition.

Chamber tooling was designed using advance prints, ordered from JGS and has been received. Chamber gaging was placed on order with Sheffield Gage (LRI-54192) in May or June and has not been received as of this writing. In mid-November Purchasing was requested to contact the vendor relative to this order and to date has not received an update. Additional follow-up is required.

Total volume for this offering has been estimated at 6000 units to be produced in June. The trial and pilot run will consist of 650 guns to be scheduled early in the first quarter to comply with a Marketing request that 300-500 guns be available for the Alaskan bear season in March.

Transmittal of model drawings and the parts list took place on September 21 on DCR 12304. Item masters, product structures and process records have been written and are in place. End label information has been entered into the WICS system under RAMAC 5903.

MODEL 1100 RETROFIT BARREL/STEEL SHOT - Verdura

The transmittal of model drawings is complete. Item masters, product structures and process records have been written and will be issued January 3rd.

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MODEL 870 FUNCTIONAL IMPROVEMENTS - Lewis/Verdura

Twenty-five of the new Delrin ejector bases have been sent to Aberdeen Proving Ground for liquid compatability testing. This test must be passed on any future military contract for shotguns. A report has been received on the results of the tests and is being evaluated to determine a path forward.

Process records and structures are complete and are on the system except for police versions which use the new ejector system. Police structures will not be activated until successful completion of trial and pilot.

MARAGING STAINLESS STEEL CHOKE TUBES - Powers

A sample of the Carpenter Maraging Stainless Steel has been received and is being fabricated by Ed Ford into 12 gauge choke tubes for evaluation as an alternative choke tube material. If acceptable, this material could provide an approximate 25% cost savings in material costs over Ferritic Maraging Steel. Testing is anticipated to begin the third week in January.

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NEW PRODUCTS AND PROCESSES - 1990 AND BEYOND

MODEL 870/1100 LIGHTWEIGHT RESTYLE PROGRAM - Lewis/Verdura

All specifications for both models have been reviewed and agreed on. At the June Product Team meeting it was decided to keep the current specifications in effect for 1989. With that decision, all work on this program was put on hold but will be picked up again in the second quarter of 1989 and the guns will be carried in the 1990 catalog.

NEW .22 AUTOLOADING RIFLE - Smith/Findlay, Sr./Findlay

The design of the stock, housing, and receiver are complete and the inletting of the stock is done. These components have been sent to the Model Shop and N/C areas for first prototype build. This work is scheduled to be completed by mid-February '89. These are the long lead time items.

The magazine box has been redesigned toward a MIM part, this will be a two piece design, the main body of the box will be molded and a stamped bottom piece will close up the box. The magazine box as well as the trigger, striker, sear, and receiver drawings will be sent to the MIM group for estimates and feasibility of manufacturing.

The receiver and housing drawings have been sent to W.F.Marks, at T.S.L., DuPont to evaluate mold-ability of these components and design strength needed to withstand bolt/striker impact.

The CAD group is currently doing a Min./Max. study on all components and a new layout is being made with updated parts. The CAD group has been a key factor in getting this design to the proto-type build stage and allowing us to be so aggressive with this scheduling.

A parts list will be made. EXP drawings have been given to the Process Development group. These drawings will be sent out for quotation and the development of an engineering estimate.

The Test Lab is doing bolt velocities, cycle times, and Pressure/Time curves on N/66's and N/77's. This data will be put in Scott Franz's newly developed "blow-back" computer simulation program to validate the program. Once validated, the computer simulation will be used to refine the operating parameters of the new rifle design.

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NEW CONCEPT SHOTGUN - Powers

Recoil reduction efforts have centered on recoil pad materials and possibly using some type of "hydraulic" damping unit in the stock. Testing of new recoil pad material samples from Rubber Industries (the prototype vendor for the DuPont Elvaloy mat'l) and Rogers Corp. has been completed. Shoulder forces are higher than anticipated. Upon the advice of Mike Branger, I have requested that R-I produce the prototype pads with a hardness of 30-35 (Shore A) instead of the original 40-45. Four prototypes from R-I arrived today, for approval, and will be inspected before authorizing production of the remaining prototypes. Recoil pad materials and testing data have an immediate application for plant purposes also.

First generation prototype design is now progressing and CAD/CAM work has begun at EDL. The action system is still intended to be gas-assisted inertia, with gas pressure being used to assist in compressing the operating spring. A patent search concerning this type of action operation was conducted by Jim Newsom (EDL). Apparently we are free to use this concept and it may be considered as patentable. Scott Franz has been requested to modify the NCS simulation to allow for another action operating concept. This concept will also use inertia with gas-assist to operate the action. The gas-assist will NOT be used to further compress the spring, but to assist in propelling the action directly. Due to Scott's commitment to the SPC program this modification is not expected until some time in 1989. Further recoil force testing (not related to the pad materials testing) which will include evaluation of the NCS, 11-87, 1100, 870 and competitive models, fired by various shooters, has been scheduled for completion by 14 Jan. For the barrel design we are considering both the GFM and Pilger manufacturing processes, with the emphasis on Pilger.

Testing results of the modified KFC prototype indicate our simulation has accurately predicted bolt velocities. Terminal bolt velocities with target and short magnum loads are nearly identical at approximately 125 in/sec. This same testing has revealed problems with magazine tube deformation which will have to be evaluated in the NCS design. Earl has sketched a concept which may solve this problem.

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NEW BOLT ACTION RIFLE - Bauman/Murphy

Little has been done on the NBAR in the previous month save for the development of a schedule outlining an ambitious path forward and some conceptualization of firecontrol, magazine latch and scope mount systems. Tom Bauman's time has been devoted entirely to the SP-10 Mag. and my time has been divided between the Parker and the Single Barrel Trap Gun.

The schedule that we developed follows and is based on a number of assumptions. Among them:

- o Tom Bauman's involvement with the SP-10 Mag. will be "limited" in 1989.
- o My involvement with the Parker and the SBT will not cause any conflicts.
- o The Model Shop and N/C group can supply timely turnaround of prototypes.
- o The Test Lab can supply timely turnaround of required testing.
- o The firecontrol is the critical path item to be developed. This assumes that the untested magazine box designed by Dick Jackson will feed properly.

I described this schedule as ambitious since it presupposes the best case scenario for each of these assumptions. Tom and I will try to adhere to this schedule but it is important that we all realize the potential stumbling blocks.

NBAR Critical Path Schedule

Firecontrol

First Design	Mar. 1 89	2 mos.
Prototype (3)	Apr. 1 89	1 mo.
Engineering Evaluation	June 1 89	2 mos.
Redesign	July 1 89	1 mo.
Quotation & Economics	Oct. 1 89	3 mos.
Prototype (10)		
- Vendor Parts	Apr. 1 90	6 mos.
Test & Redesign	May 15 90	6 wks.
Build 30 Design Accept.	Feb. 15 91	9 mos.
and Trial and Pilot		
T & P Testing	Apr. 15 91	2 mos.

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NEW BOLT ACTION RIFLE (cont.)

This is a list of the NBAR features, (that represent our design goals), in order of priority.

- o Detachable Magazine Box
- o Improved Firecontrol
 - No Connector
 - Two Trigger Pull Springs (low spring rate)
 - "Sealed Firecontrol"
 - Balanced Trigger
 - Trigger and Sear Block
 - Not Retrofittable to M/700
- o Bolt Lock w/override
- o Integral Scope Mounts
- o New Extractor
- o New "Custom Shop" Barrel Contour
 - Mountain Rifle Crown
- o Improved Bedding System
- o M/700 receiver, cosmetically altered
- o New Wood Stock

ELECTRO-CHEMICAL RIFLING - Lewis

An updated quote has been received from Cation Corporation. Estimated testing costs are needed from the Test and Measurement Lab in order to prepare an updated economic evaluation. This is necessary before a Part II to the project can be submitted.

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NEW AUTOLOADING RIFLE (NAR) - Powers/Findlay Sr.

This program is recently getting underway. The objective is to design a product which will replace the M/7400, but NOT the M/7600. This program's goals will be similar to those of the new .22 rimfire rifle:

- o Designed for high functional reliability
- o Designed for manufacture/assembly
- o New and/or improved safety features
- o Lower manufacturing cost

As with the .22 rimfire program, the majority of the actual design work will be done under contract by Dave Findlay, Sr. Remington personnel assigned to the program are: Tom Powers - Design and CAD/CAM, and Tom Plunkett - CAD/CAM.

Initial caliber offerings (tentative) are .30-06 and 7mm. The gun will operate on the Ljungman gas system principal, similar to the Egyptian Rashid rifle.