

REMINGTON ARMS COMPANY, INC.

INTER-DEPARTMENTAL CORRESPONDENCE



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November 2, 1988

TO: D. K. Albrecht
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J. F. Matousek, Jr.
R. J. Orf
C. A. Riley/E. O. Fini
K. W. Soucy
J. F. Winske
File: Tech. Monthly Reports

FROM: W. H. Coleman, II

ILION R & D AND TECHNICAL
MONTHLY REPORTS
OCTOBER 1988

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

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November 2, 1988

TO: W. H. COLEMAN, II
FROM: L. B. BOSQUET/T. C. DOUGLAS

NEW PRODUCTS DEVELOPMENT MONTHLY REPORT - OCTOBERCURRENT PRODUCTSEKSTROM-CARLSON CHECKERING MACHINE - Monteau/Hickey

Work is continuing toward getting the Ekstrom-Carlson checkering machine ready for production. Last month's report indicated that the "EDIT EKSTROM" sub-routine was apparently working. This statement has to be revised as the sub-routine is working on fore-ends but not on stocks. When trying to work with stock programming the software is giving the programmer an input error message and will not allow any further input. A tape demonstrating this constraint was sent to Synermation on October 21. They were also contacted by phone and feel that the problem is not serious and can be resolved without a lot of difficulty.

The Model 11-87 fore-end is being reprogrammed to determine whether or not a positioning problem that showed up in the latest version of the "EDIT EKSTROM" routine may be the result of an error in our data base. An answer should be available by the end of the month.

The long term goal of the work being done with Air Turbine Technology on cutter motors is to reduce the noise level to the point where hearing protection is not required. Air Turbine is still working on the six motors which we sent back and anticipate having the problem resolved and motors back to Remington by December 1. Another area being pursued is the early bearing failure experienced on four motors. Several alternative bearing designs are being investigated.

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.

CONFIDENTIALEKSTROM-CARLSON CHECKERING MACHINE (cont'd.)

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 this controller with the same model that is used on the new Ekstrom-Carlson machines. This would essentially make both machines identical for programming, operation and service.

SNIPER WEAPON SYSTEM - Douglas

On July 28th, the U. S. Army approved First Article testing of Model 700 M24 SWS and released Remington for production of the original contract 500 systems. They also awarded Remington the 1988 option for an additional 500 systems with a contract value of \$1950M, bringing the total awarded contract to \$4450M.

The delivery schedule was revised as follows:

Oct. 25, 1988 - 100	Sep. 22, 1989 - 150
Dec. 21, 1988 - 100	Dec. 20, 1989 - 150
Mar. 29, 1989 - 150	Mar. 20, 1990 - 100
Jun. 23, 1989 - 150	Jun. 30, 1990 - 100

The second mandrel for the Remington 5R, 11.25 inch twist GFM produced SWS barrels has been run, producing barrels with excellent dimensions. Ammunition has been obtained. Initial testing will be 200 yard accuracy from the machine rest. Three rifles made from the first mandrel and three rifles made from the second mandrel are currently being tested. This initial testing should be completed in November.

BOSTOMATIC CHECKERING MACHINE - Monteau/Hickey/Inserra

One of the systems being looked into for expanding the memory of the Bostomatic checkering machine has the potential to provide faster and more trouble free changeover from pattern to pattern by storing the programs and downloading them on command. A quote for a fileserver has been received in the amount of \$18,025. Installation and training are an additional \$500 per day. A demonstration of the system will be arranged to help in the evaluation of the proposal.

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BOSTOMATIC CHECKERING MACHINE (cont'd.)

To help increase the float capabilities of the cutter heads and reduce the amount of touch-up required, the nose piece and follower shoes have been redesigned. Both have been received and will be installed and tried at the convenience of production.

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. Work is moving ahead with the "Wrapped Pattern" and "CKEdit" routines. Bob Turner has begun the process of refining and debugging sub-routines. He is also creating the interconnections between sub-routines which will make it less cumbersome and time consuming to program a checkering pattern.

He has supplied an early iteration of the "user friendly" format which was tried and found to contain some problem areas. These have been communicated to him and are being resolved. A fourth quarter completion is still realistic.

MULTI-HEAD CHECKERING IMPROVEMENTS - Monteau

There is an on-going program aimed at improving the reliability of the equipment, quality and throughput of the process, and the environmental quality of the checkering area. One part of this program is to reduce the noise level to the point that hearing protection is not required in the checkering area. A major source of the noise in the area is the hydraulic package associated with each machine. To reduce the noise to an acceptable level, sound deadening enclosures have been designed and installed at each machine. The Safety Office will be requested to conduct sound level tests to determine if and where additional work may be required.

The "Z" and "TILT" drive units are being revised to provide more dependable operation and easier maintenance. All components necessary to accomplish this have been received and are being worked on in the Tool Room.

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TOOL DESIGN - Monteau

All information needed for the preparation of a project to replace the Bruning 870 print machine with a non-ammonia whiteline printer was supplied to Industrial Engineering on September 12. A three month rental with an option to purchase is being proposed. If approved, this will eliminate the use of ammonia and its' potential hazards.

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 two advance parts have been received. These parts are acceptable and authorization for the remainder of the prototype run has been given. We previously hoped to eliminate the need for reinforcing patch in the fore-end, but testing has proven that this is not currently feasible.

CONFIDENTIALNEW PRODUCTS - 1988 CATALOGPARKER - 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 ten prototype barrel assemblies brazed in August are in the process of being finish machined and fitted to the frames. A radiographic inspection procedure has been designed, however, only two of our ten brazed barrel assemblies have been inspected. Kolar is looking for a vendor in their vicinity to perform this service. A formal report on the inspection procedure will follow from Fred Schmidt.

Nuclear application braze joints allow for approximately 40% void, (evenly dispersed), and our Parker barrel assemblies should meet this standard. We will also have a bond superior to the original Parker and the Model 21 that we used for comparison.

- o The stock drilling fixture has been designed by Tim McCormack and Kolar. A quotation has been received, a project has been written, and the fixture is being fabricated. Timely agreement on it's design was not achieved and this may delay the start of testing. I will be traveling to Racine Nov. 1 to verify that this fixture will meet Tim's needs. In addition, I plan to return with seven Parker barrel assemblies in the white. These guns need to be stocked, polished, colored, and refitted before testing can begin.
- 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.

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PARKER (cont'd.)

- o It has been difficult to schedule the work of Kolar, particularly without the ability to significantly influence their efforts, however, the following schedule is possible.

Prototype Metalwork
Delivered to Remington November 4

Stock, Polish, Color November 16

Refit Metalwork (Kolar)
Ready for Test November 21

- 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 waiting for approval from Jim Hutton, Bill Ericson, and Ken Green.

CONFIDENTIALNEW PRODUCTS - 1989 CATALOGSP-10 MAGNUM - Rowlands/Bauman/Lewis/Verdura/Murphy

An improved extractor retainer has been developed that increases extractor tension and allows reliable extraction and ejection of Rem. 10 Ga. shells with out-of-spec. rim angles. The stamping vendor will be contacted to determine the fastest way to modify his tooling to produce parts for the trial and pilot guns.

Fourteen guns have been built and shipped to Texas for use at the Writers Seminar.

Some of the investment castings and MIM parts are out-of-tolerance on some dimensions. In the majority of cases the surfaces are not critical and the part print dimensions will be adjusted to allow acceptance of the parts. Surfaces that are critical will be adjusted by reworking at Ilion. Our intent will be to minimize or eliminate any mold tooling modifications that might potentially delay delivery of production parts. Plans are being firmed up for a trip to Vestshell to address these issues.

The SP-10 Mag. will be furnished with two Titanium coated maraging steel choke tubes in Modified and Full choke. These will provide nominal pattern densities of 65% and 75% at 40 yards with 1 3/4 ounce steel BB ammo. A third choke tube is being developed to provide Extra Full patterns with #6 lead shot for use by the turkey hunters. This third tube will be made from stainless steel, with no additional coatings. The maraging steel choke tubes also shoot Modified and Full choke pattern densities with lead shot. It remains to be determined if these tubes will be "dual marked" for lead and steel. The choke tube wrench for the 10 and 12 gauge will incorporate a 3/8" square socket for use with a ratchet wrench.

Final parts have been received from the model shop for the alternate feed system design and it has been assembled. Alterations to the carrier need to be made to eliminate an intermittent trap shell condition. Layout work is currently being done to determine the extent of the modifications required to prevent the shell from the magazine interfering with the extracting shell. Work also needed to be done to redesign the extractor system. This redesign work is complete and new extractors need to be made by the model shop before the gun can go into test.

CONFIDENTIALSP-10 MAGNUM (cont'd.)

The first meeting of the Design Review Team was held May 26. An overview of the review process was presented and the team members were shown the SP-10 Mag. cut-away gun and the improvements compared with the Ithaca Mag-10 were discussed. Sub teams were assigned to examine the firearm from a systems approach using a form of failure mode analysis and report back their findings.

Product structures have been entered into the MRP system and verified. About 95% of the Process Records have been updated and released for typing. Shop Floor Routers are being entered as the Process Records are released. Four process records have not been issued as of this date. They will be released as tooling numbers are available.

S&K will have the trial and pilot lot of both stocks and fore-ends processed and shipped to Ilion by the end of the month. The wood will be furnished ready for NC checker and will have the final coat of finish applied here. As was mentioned last month, the fore-end checkering tape is ready for production and was used to checker parts for the writers guns. Because of continuing difficulty in programming the Ekstrom-Carlson, the Bostomatic was programmed for the writers guns.

Operator training has taken place on the K&T machining center and controller maintenance classes are continuing. Joe Inserra attended a machine maintenance course in October and will be training Remington personnel in-house.

All components necessary for the acceptance run-off of the permanent tooling for the K&T machining center has been shipped and is at the vendor's facility. The run-off has to be scheduled but it now appears that it will be around the middle of November. The successful run-off will be the final step in the acceptance of the complete turnkey package.

With the exception of five investment cast parts and the components made by the MIM process, all purchased parts are available in trial and pilot quantities. Most of them have been processed and are ready for final assembly. Barrels and receivers have been started. Programming of the trigger plate for FMS is underway. The "A" loading has been completed and tried - the "B" load programming is well along and "C" load tool packages are being set up and specified so that programming can be started.

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TURKEY CHOKE TUBE - Murphy/Powers

Design Acceptance Testing by the Ilion Technical Section of 15 tubes from Kolar Arms is complete. The 3 inch Kolar tube provides the shooter with approximately a 5% increase in pattern percentage versus the standard Full choke tube. The 3 inch choke tube will be made from our current stainless steel material and will be coated black due to the fact that they protrude 1 inch from the muzzle. The design has been transmitted to the plant.

Although this tube has been accepted and production quantities are being received, Purchase Parts Inspection does not have a good way to inspect them. An identical tube, with the exception of a straight taper instead of a parabolic taper, is in the Test Lab for pattern evaluation along with a vendor production tube. If this tube performs as well as the parabolic tube, then we could adopt it and simplify inspection.

MODEL 870/1100 LIGHTWEIGHT RESTYLE PROGRAM - Lewis/Verdura

All specifications for these models have been reviewed and agreed on. The complete drawing package has been transmitted. The process records and item masters have been completed. The product structures were started. Further work on this item has been put on hold but will be picked up again in the second quarter of 1989 as the result of a Product Team decision.

At the June Product Team meeting it was decided to keep the specifications for 1989 the same as currently offered. They will remain the same until the fourth quarter of next year. All lightweights produced in the fourth quarter of 1989 will be to the restyle specifications and the guns will be carried in the 1990 catalog.

SLUG GUN SYSTEM - D.Findlay

The R&D Test and Measurement Laboratory has found the design acceptance evaluation of the 12 Ga. Model 870 and Model 11-87 shotguns utilizing the cantilever scope base design, Tasco scope rings, rifled choke tube, and trap stock system to be acceptable for transmittal. Transmittal will be completed by October 31 for introduction third quarter 1989.

CONFIDENTIALSLUG GUN SYSTEM (cont'd.)

Testing of the cantilever scope mount system was found to be more accurate with all ammunition types tested (Rem. 1 oz., Win. 1 oz., Fed. 1 oz., BRI sabot) than current models or Hastings type replacement barrels for our guns. This experimental system also completed all endurance and improper handling testing with no difficulty. The results of the high pressure strength testing with the experimental system was comparable to identical testing on the current Model 870 and Model 11-87 12 gauge shotguns.

The accuracy evaluation consisted of shooting three five shot groups with Remington, Federal, BRI, and Winchester slugs through all test and control samples resulting in a total of 60 groups for each ammo type and 15 groups per system. All accuracy results are for 50 yards.

SYSTEM	M/870	M/11-87
CANTILEVER WITH RIFLED TUBE	3.2 IN.	3.5 IN.
CONTROL BARRELS	4.6 IN.	4.8 IN.
HASTINGS BARRELS	6.0 IN.	4.9 IN.

The ammunition used in the testing ranked in the following order (from best group size results to the worst group size:

1. BRI
2. Remington/Winchester
3. Federal

Samples of the gun have been approved by the product team and have been released for catalog photography, which has been done, and for the sales meeting.

MODEL 700 SYNTHETIC ARYLON STOCK - Smith

The synthetic stock offering for 1989 will be made from Du Pont Arylon. This stock will replace the current stocks made from Rynite and the right hand fiberglass stocks from Brown Precision. The Arylon stocks will be made in Lee Six's current mold. The options will be as follows:

- BDL only
- long action
- short action
- magnum barrel channel
- varmint barrel channel

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MODEL 700 SYNTHETIC ARYLON STOCK (cont'd.)

A sample was sent in for evaluation, complete stock assembly. This sample was assembled with a barreled action and shown to Marketing personnel on Monday, October 17th, for their approval. The stock was acceptable with noted areas of concern:

- The fit of the grip cap and recoil pad.
- The texture of the stock being consistent from end to end.
- Front and rear swivels being perpendicular to the stock.
- Rear take-down screw hole aligned and diameter correct.

A letter was sent to Lee Six outlining these areas and giving him the go ahead to run the 200 stock Trial-And-Pilot sample run. This run should begin the week of October 24th and shipment made the first week of November.

Lee Six has received the contract and is reviewing it with his lawyers.

This offering gives us first use of Arylon as a stock material and will replace the Brown Precision and Choate stocks for 1989, however the question of long range supply of synthetic stocks has not been answered and the determination of us developing a mold with a Mountain Rifle outside configuration also has not been answered.

MODEL 700 CLASSIC .300 WEATHERBY MAGNUM - Martin

The Model 700 Classic offering for 1989 will be the .300 Weatherby Magnum. This will be a synergistic offering from Firearms and Ammunition. Lonoke has provided Ilion with chamber drawings and reamers. Ilion will provide Lonoke with three pressure barrels and one complete firearm for their ammunition development. Ilion will have five more completed rifles awaiting shipment of pilot run ammunition for Design Acceptance Testing.

Design acceptance testing has been successfully completed and Transmittal has been made.

Chamber tooling and gaging has been designed and placed on order from advance prints to assure their being available in time to run the trial and pilot. Chamber tooling has been received from JGS and gaging is to be shipped from Sheffield on October 28. Item masters, product structures and process records are being prepared and will be issued by the end of the month.

CONFIDENTIALMODEL 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.

MODEL 1100 MAGNUM RETROFIT BARREL/STEEL SHOT - Franz/Powers

The Test & Measurement Lab report has been approved and distributed. The design has been transmitted.

M/1100 12 ga. Steel Shot Barrel Specifications

Gauge: 12

Barrel Rollmark: 2 3/4 inch Magnum and 3 inch Magnum
Shells - Steel Shot

Orifice: one .088 in.

One Choke Tube:

- Name: Remington Long Range Steel
- 80% patterns at 40 yds. (w/2 3/4" Magnum 2's)
- constriction: same as current full tube
- material: VascoMax 250 Maraging Steel
- titanium nitride finish

Barrel Lengths: 26 and 30 in.

Barrel Finish: Standard polish Black Oxide finish.

The barrel hang tag has been reviewed by Marketing and the Litigation Support groups.

Transmittal has been completed. We just recently discovered we have a problem marking the tube after it has been coated. Samples sent to our marking equipment vendor were returned and sent to the Chem & Met lab for salt spray along with a tube that was marked first and then coated. Results of five hours of salt spray indicate that the coating first and then marking process is NOT acceptable. The marking first and then coating process IS acceptable but we would like a better marking before the coating is applied. The marking equipment vendor currently has developed an optimum marking process for uncoated tubes. These samples will be available on October 26th for evaluation and sending out to our coating vendor.

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NEW PRODUCTS AND PROCESSES - 1990 AND BEYOND

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

This program will complement the present family of .22 autoloaders, M/552, N-66, and N-77. The new autoloader will be designed around an existing barrel and magazine box to allow the remainder of the parts to be sourced with minimal machining and finishing operations required. The wood stock version of this gun must be price competitive with the Ruger 10-22.

Components are being produced in the Model Shop with the breech bolt and disconnecter currently being worked on. The housing has been detailed and is being checked for corrections.

The housing and receiver drawings have been given to both the N/C group and the Model Shop to estimate for prototyping these parts in aluminum and/or steel. We will still continue to work with Bill Marks at T.S.L. and use his suggestions for moldability of these components, and possible prototype work with the composite group.

The stock drawing and surfacing should be completed by the end of November and then given to the N/C area (Tom Plunkett is working on the stock).

An updated schedule has been worked out and is being drawn up by Bill Pickett on the C.V., we are still looking to have our first proto-type gun in the first quarter of 1989.

A parts list will be made and completed prints will be given to Brad Bosquet as soon as he is ready to handle them.

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.

CONFIDENTIALNEW 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. will be scheduled. Recoil pad materials and testing data have an immediate application for plant purposes also. Prototype pads from Rubber Industries made of DuPont Elvaloy 50D are due by mid-Nov.

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. 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. Further recoil force testing which will include qualitative evaluation of the NCS, 11-87, 1100, 870 and competitive models will be scheduled by month's end.

NEW BOLT ACTION RIFLE - Bauman/Murphy/Martin

Fred Martin will be working on the implementation of the SPC program. Tom Bauman will now be the Team Leader working with Randy Murphy. Fred will act as a resource to the program if possible. A meeting was held on October 31st with the new team and the old team to get the new players up to speed on the program.

The receiver design will be a standard M/700 receiver with secondary cuts required for the bolt lock and possibly minor cosmetic changes in non-critical areas. We will continue to investigate providing the gun with rings and bases versus the previous integral receiver mounting.

The barrel will be a Custom Shop contour with a Mountain rifle crown. Upgraded iron sights as provided on Custom models. The barrel modeling and detailing has been completed on the CV system.

The magazine box will have a detachable bottom that will conceal any gaps or mismatch between the box, trigger guard, and/or the stock. First prototypes of the new design have been received for evaluation and test. It is planned to have the testing completed in September.

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NEW BOLT ACTION RIFLE (cont'd.)

The trigger guard, magazine follower, magazine release, and magazine spring have been sent out for quotes.

Testing of a patented new technology rifle barrel in a joint program between Remington and D.C.Brennan Firearms, Inc. has been completed. The Brennan technology claims a 25% increase in accuracy with reduced recoil. However, test results show no significant improvement over our current design (at the 95% confidence level). As soon as the final report is complete, D.C. Brennan will be notified.

ELECTRO-CHEMICAL RIFLING - Lewis

An updated quote has been received from Cation Corporation. As soon as the estimated testing costs are available from the Test Lab, an updated economic evaluation will be done and a Part II to the project submitted.